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THE UNIVERSITY OF ALBERTA

# VERBAL REPORTS AND SELF-EFFICACY IN POLE VAULTING

BY

JAMES RICHARD BONDARENKO

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

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EDMONTON, ALBERTA

SPRING, 1987

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James Bondarenko

5304 - 102 Avenue
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled VERBAL REPORTS AND SELF-EFFICACY IN POLE VAULTING submitted by JAMES RICHARD BONDARENKO in partial fulfilment of the requirements for the degree of MASTER OF ARTS.

Rick Anderman
Supervisor

Murray Smith

Wayne

Date: Dec. 9, 1986

## DEDICATION

To my parents, Natasha and Konstantyn Bondarenko.

## ABSTRACT

The purpose of this study was to explore the relationships between self-efficacy, thoughts and performance while subjects learned to pole vault. A secondary purpose of the study was to compare the thought listing method of verbal reporting with the stimulated-recall and think-aloud procedures.

The results reveal that self-efficacy was shown to be a stronger predictor of subsequent performance than were past performances and that this relationship did not become stronger over time. Performance also was seen to be a predictor of self-efficacy in accord with Feltz's (1982) conclusion that a reciprocal relationship exists between the two variables. Female subjects had lower average self-efficacy scores than males. Subjects with high average self-efficacy scores tended to be more task focused and less negative than subjects with low efficacy scores.

The lower performing group differed from the upper group primarily in having proportionately more negative thoughts on failed attempts. Overall the lower group had greater proportions of statements in both self-instructional and evaluative categories than the upper group. Female subjects tended to be more positive on successful attempts than were males and less negative on failures. These differences seemed to be reflected in the greater proportion of self-instructional and fewer evaluative statements by female subjects.

A comparison of the verbal report methods indicates similarities between both retrospective methods (stimulated recall and thought listing). Subjects reporting thoughts via the think-aloud procedure had either none or very few thoughts reported during performance in contrast to the retrospective methods. The results from the post-session questionnaire revealed that subjects had the greatest difficulty reporting thoughts during the performance.

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# CHAPTER I

# INTRODUCTION

## A. The Nature of the Problem

In physical education, there are a number of activities which, by their very nature, are likely to produce anxiety or hesitancy in students or athletes when they are initially confronted with a learning situation. These activities have been classified as "high avoidance" by Feltz, Landers, and Raeder (1979). They are characterized by a withdrawal reaction from novice performers who may perceive the situation as being unpleasant or dangerous (Feltz et al., 1979). Among these activities are gymnastics, swimming, diving, and pole vaulting.

In the field of sport psychology a number of methods have been adapted from the clinical setting in an effort to help athletes cope with avoidance and anxiety responses. Behavioral techniques such as relaxation training and systematic desensitization as well as more cognitive oriented procedures such as rational-emotive therapy, thought blocking, and positive imagery have found a place in the reduction of stress in the sporting context. In addition research by Bandura (1977a) demonstrates the strength of performance-based procedures such as guided participation, performance desensitization, and participant modeling in effecting psychological and behavioral changes in stressful situations.

Bandura postulated self-efficacy theory to account for the varied effectiveness of different methods of treatment for stress. The basic premise of self-efficacy theory is that psychological procedures serve to create and strengthen efficacy expectations. Self-efficacy can be defined as the confidence one has in being able to perform an action (Feltz, 1982). Perceived self-efficacy operates as a cognitive mechanism processing various sources of information according to which choice of behavior, persistence, and effort in coping with stressful situations are determined given the skill and incentives to do so (Bandura, 1977a).

Self-efficacy is dependent upon four sources of information; 1) performance accomplishments, 2) vicarious experiences, 3) verbal persuasion, and 4) emotional arousal. Past performances are the strongest source of efficacy information because they are based on direct experiences (Bandura, 1977a; Bandura, 1982; Feltz, Landers, & Raeder, 1979; Lee, 1984a).

Bandura's theory has been criticized by researchers in the field primarily on two counts: 1) for a lack of clarity in defining the relationship between efficacy expectations and outcome expectations (Borkovec, 1978; Eastman & Marzillier, 1984; Kazdin, 1978; Kirsch, 1985; Teasdale, 1978), and 2) the experimental methodology used by Bandura (Eastman & Marzillier, 1984). Though the first, largely theoretical issue remains unresolved, researchers have made changes in their experimental methodology.

Eastman and Marzillier (1984) have criticized Bandura for using a 100 point probability scale with only 90 points on it and for using the verbal labels "quite" to "moderately uncertain" to represent a range of 40 scale points while "moderately uncertain" to "certain" represents 50 points. Some researchers such as Feltz (1982) have constructed 100 point probability scales with the appropriate verbal labels in keeping with these criticisms.

Bandura's use of a microanalytic procedure reporting percentage-match scores has also been challenged. Kirsch (1985) suggests that the high concordance rates reported by Bandura are a result of limiting his subjects to evaluations of a few predictable, hierarchically arranged tasks, and that once one decides one can perform a given task in a hierarchy all the tasks below that level can also be performed. For tasks such as pole vault and high jumping, though they can easily be arranged in a hierarchy, performing them at a given level does not ensure success at a lower level. Lee (1985) points out that the degree of match in a hierarchy of behaviors predictable by chance varies with the level of behavior. Though it is possible to compute the chance levels of match, this information has not been published thus the results are not easily interpretable (Kirsch & Wickless, 1983). In addressing these issues Lee (1985) and Cervone (1985) have suggested the use of chi-square, phi-coefficient, and randomization tests to strengthen the interpretability of results.

Self-efficacy has proven to be a successful predictor of future performance in such diverse settings from the treatment of phobics

(Bandura, 1983; Bandura & Adams, 1977; Bandura, Adams, Hardy & Howells, 1980) to musical performance (Kendrick, Craig, Lawson & Davidson, 1982).

In addition to these findings a number of studies have examined the role of self-efficacy in the sport setting. Lee (1982), and McAuley and Gill (1983) found that self-efficacy was a stronger predictor of performance than were previous performances in female gymnasts. Barling and Abel (1983) studied the relationship between self-efficacy and tennis performance and found them to be significantly and positively correlated. In contrast Woolfolk, Murphy, Gottesfeld, and Aitken (1985) found that prior performance was a stronger predictor of subsequent performance than was self-efficacy in a golf putting task.

A number of studies have investigated the role of self-efficacy as a cognitive mediating variable. Research by Gould and Weiss (1981) indicated that self-efficacy was not the major mediating variable affecting performance changes on a muscular endurance task. Feltz (1982) investigated the role of self-efficacy as a cognitive mediating variable in the performance of a diving task by novices. Bandura's (1977a) position that self-efficacy is a better predictor of performance than past performances was confirmed only for the first trial (four in total). Thereafter past performances were significantly stronger predictors of subsequent achievement. Over trials the strength of self-efficacy as an effect increased while its causal influence decreased. A possible explanation of these findings is that the divers did not have sufficient time to develop percepts of self-efficacy strong enough to account for subsequent performance as well as previous performances did.

One may expect that this would be the case with subjects learning a novel task. Similarly, the findings of McCauley (1985) indicated that efficacy cognitions were significant predictors of performance of a gymnastics skill and mediated between modeling treatments and performance. Vallerand and Reid (1984) found that self-efficacy mediates the effect of verbal feedback on intrinsic motivation. The authors stressed that studies should be conducted in field settings to increase the ecological validity of present findings. Seldom have researchers attempted to study the development of efficacy expectations and its concomitant relationships with other variables over time in natural environments.

Few studies have investigated the relationship between subjects' thoughts and self-efficacy. Scanlan and Lewthwaite (1984) and Scanlan, Lewthwaite, and Jackson (1984) suggested that prematch performance expectancies and failure cognitions successfully predicted prematch state anxiety levels and the performance of young competitive wrestlers. The relationship between performance expectancies and cognitions were not examined. Wilkes and Summers (1984) found that performance differences were not in conjunction with any consistent changes in cognitive states. The authors mentioned that on simple tasks with a low technical component focusing attention on the end result is more effective than focusing on how the task is to be performed. In view of these results the use of a high avoidance complex task such as pole vaulting may provide richer cognitive data with a greater focus on task execution. In addition the fact that one can measure performance

objectively making pole vaulting particularly suitable for studies of self-efficacy.

With the present emphasis on cognitive restructuring techniques in theapeutic programs (e.g. Long, 1984) as well as studies attesting to the importance of assessing athlete's thoughts (Klinger, Barta, & Glas, 1981; Mahoney & Epstein, 1981; Meyers, Schleser, Cooke, & Cuvillier, 1979) the question of the validity and differences between various cognitive assessment procedures becomes of central importance. Nisbett and Wilson (1977) have argued that individuals' self-reports are post-hoc rationalizations of their behavior as opposed to a veridical recollection of past experience. Subsequent investigations by Ericsson and Simon (1980) and Adair and Spinner (as cited in Meichenbaum & Cameron, 1981) provide guidelines for researchers to follow in order to increase the credibility of self-report data. Recent research by Blackwell, Balassi, Galassi, and Watson (1985) has addressed the issue of differences between cognitive assessment methods. Their investigation indicated significant differences between think-aloud and thought listing procedures, reaffirming the views of Meichenbaum and Cameron (1981) that further research to compare various procedures is necessary. Few studies in the area of Sport Psychology have investigated the differences between cognitive assessment procedures.

## B. Statement of the Problem

The major purpose of this study was to explore the relationships between thoughts, self-efficacy, and performance in subjects learning to

pole vault in a natural learning environment. Through a thought-listing procedure the relationship of subjects' thoughts to the other variables in the study were investigated.

A secondary purpose of this study is to compare several methods of cognitive assessment. In particular, results obtained using the thought listing procedure were compared to those obtained via the visually based stimulated recall and think-aloud procedures.

C. Hypotheses

Though this study is exploratory in natural several specific hypotheses were examined:

1. In the initial stages of learning a complex motor skill past performances are a stronger predictor of subsequent performances than are efficacy expectations.
2. As subjects acquire skill, self-efficacy becomes an increasingly stronger predictor of performances.
3. Low percepts of self-efficacy are associated with negative, unrealistic, or irrelevant thoughts.
4. High percepts of self-efficacy are associated with positive, realistic, and task relevant thoughts.
5. a) Low efficacy expectations are associated with poorer performances and conversely b) high efficacy expectations are associated with better performances.

D. Delimitations

This study was limited to college-age males and females attending the University of Alberta participating in Physical Education 229--Introduction to Track and Field II (2 sections). The results of the study are limited to the specific tasks and subjects employed.

E. Definitions

Anxiety--a state of uneasiness which may be characterized by one or more of the following: subjective feelings of apprehension, the occurrence of physiological arousal, behavioral manifestations of arousal, and/or avoidance behavior.

Avoidance behavior--a type of reaction in an anxiety provoking situation involving hesitancy or refusal to perform the task. In the present study, avoidance is indicated by a refusal to jump as indicated by a run through, balk, or aborted attempt to jump.

Cognitions--as defined by Ellis and Hunt (1983) are a class of symbolic mental activities such as thinking, reasoning, memory search, and so forth.

Perceived Self-efficacy--as defined by Bandura (1977a), the conviction that one can successfully execute the behavior to produce a certain outcome; a situationally specific self-confidence. Efficacy expectations are concerned with one's judgement of one's capabilities to execute a given level of performance. For the purposes of this study self-efficacy was indicated by a score on the Jumping Efficacy Scale.

Perceived self-efficacy will be regarded as synonomous with such terms as self-percepts of efficacy and efficacy expectations.

Pole-vaulting performance--is indicated by the height of the bar, and one's behavior during the attempt; a) runthrough, b) balk--hard braking without take-off, c) aborted attempt, d) failed clearance attempt, and e) a successful clearance.

Subject's thoughts--refers to the content of the subject's cognitive processes at a given time, that the subject is aware of, including imagery self-talk, and verablized perceptions of feelings and beliefs.

F. Limitations

1. The thought listing procedure may produce data which are incomplete, due to forgetting.
2. This study includes all the limitations of passive-observational studies (e.g., inability to control extraneous variables).

## CHAPTER II

## REVIEW OF THE LITERATURE

As noted in Chapter I, Bandura proposed self-efficacy theory to account for the different effects of various psychological procedures used to reduce the effects of stress. In recent years the increasing attention that is being paid to the theory by Sport Psychologists may be attributed to the stress the theory placed on one's performance and enactive mastery treatment methods. In addition current research reflects a renewed interest in the significance of athletes' thoughts to performance. Thus an understanding of the advantages and disadvantages of cognitive assessment methods becomes important. This chapter presents a review of the literature sub-divided as follows: A) a review of studies emphasizing cognition and self-efficacy in athletic settings, and B) research on cognitive assessment methods.

### A. Self-Efficacy and Cognition in Sport

A number of studies have investigated the role of self-efficacy as a predictor of performance in sporting contexts. Lee (1982) tested the hypothesis that expectations of self-efficacy are stronger predictors of future performances than are past performances with a group of young female gymnasts. The athletes' self-efficacy was found to be a stronger predictor of performance than were previous performances. A possible

problem with this study was that self-efficacy was measured one week prior to performance. In this instance other factors may have been responsible for the results, a problem suggested by Bandura (1978). Research by McAuley and Gill (1983) has substantiated these findings with college age gymnasts. ~~In~~ this study self-efficacy was measured just prior to warm-ups before competing. Barling and Abel (1983) found that efficacy expectations bore a significant and positive relationship to tennis performance whereas outcome expectations did not. A study conducted by Weinberg, Gould, and Jackson (1979) using performance in a muscular endurance task, confirmed Bandura's contention that high self-efficacy subjects will persist at a task longer than low self-efficacy subjects. Weinberg, Yukelson, and Jackson (1980) confirmed these results and extended them to include back-to-back competitive situations. In addition public vs. private expectancy statements did not vary in their effects on performance. Subsequent research by Weinberg, Gould, Yukelson, and Jackson (1981) measured high and low, pre-existing and manipulated self-efficacy. Their results indicated that changes in self-efficacy corresponded to changes in performance with their effects dependent on which of two trials were being performed. Thus, the pre-existing high and low self-efficacy subjects differed only on the first trial. On the second trial the high-manipulated self-efficacy subjects extended their legs longer than the low manipulated subjects. These results support the view that internal factors, behavior, and the environment all act as reciprocal determinants of each other (Bandura, 1978).

Feltz (1982) investigated the role of self-efficacy as a cognitive mediating variable in the performance of a diving task. Path analysis methodology was used to compare a model based on Dual-process theory with a model based on self-efficacy theory. The study revealed little support for either model. Bandura's (1977a) position that self-efficacy is a better predictor of performance than past performances was confirmed only for the first trial. Thereafter past performances were significantly stronger predictors of subsequent achievement. Also, in contradiction with Bandura's theory, heart rate did not have a consistent effect on self-efficacy. A respecified model was constructed in which self-efficacy and performance were postulated as direct influences on future performance. In accordance with Bandura's theory, the respecified model revealed a significant reciprocal relationship between self-efficacy and performance. Since the respecified model was not constructed a priori, it had to be tested with another population. The original study was replicated by Feltz and Mugno (1983). The results supported Bandura's theory in that past performances had a greater effect on self-efficacy than either autonomic perception or physiological arousal. That autonomic perception significantly influenced efficacy which in turn influenced performance, supported the view that self-efficacy is a cognitive mediating mechanism. A reciprocal relationship was shown between self-efficacy and performance. Over trials, the strength of self-efficacy as an effect increased, while its causal influence decreased. Contrary to the findings of Bandura, Reese, and Adams (1982) physiological arousal was not seen to have a

reciprocal relationship with self-efficacy. Other studies by Lane and Borkovec (1984), Barrios (1983), and Kendrick et al. (1982) have supported these findings. It may be argued that physiological arousal is a relatively weak source of information of judgements of self-efficacy to be based on and further; more than one measure of arousal may be needed to show significant relationships with self-efficacy because of individual differences and variance in autonomic reactivity. This view has been shared by Kendrick et al. (1982).

McAuley (1985) assigned female undergraduate students to one of two modeling groups or a control group to perform a balance beam task. A model based on self-efficacy theory was compared with an anxiety reduction model. The results indicated that self-efficacy was a significant predictor of performance whereas the anxiety-performance path was not significant. Subjects in the modeling conditions exhibited higher self-efficacy, performance and lower anxiety ratings than the control group. The effects of live, participant, and videotaped models on the learning of a diving task was investigated by Feltz, Landers, and Raeder (1979). The participant modeling treatment group performed more successful dives and had stronger efficacy expectations than either the live or videotaped modeling groups. This supports Bandura's (1977a) view that performance based treatments will have a more powerful effect than vicarious methods. Recent evidence by Kavanaugh and Hausfield (1986) suggested that moods influenced physical performance. However self-efficacy, though it was a good predictor of performance for the performance task, was unaffected by mood. Mood however, did alter self-

efficacy for a more familiar task reflecting the possibility of effects from task differences.

Research by Gould and Weiss (1981) suggests that similar models influenced performance on a muscular endurance task to a greater degree than models perceived as dissimilar, and that modeling had a greater influence than positive self-talk. The results also indicated that self-efficacy was not the major mediating variable affecting performance changes. In their investigation of the role of verbal feedback on intrinsic motivation and perceived competence, Vallerand and Reid (1984) found that perceived competence mediates the effect of verbal feedback on intrinsic motivation as predicted by Bandura's theory. Yan Lan and Gill (1984) have demonstrated that self-efficacy mediates arousal changes. A cognitive feedback manipulation did not influence self-efficacy or stress responses.

Several studies have investigated the relationships between subject's thoughts and self-efficacy. Scanlan and Lewthwaite (1984) stated that performance expectancies and competitive trait anxiety were the best predictors of prematch stress among adolescent wrestlers. Further analysis by Scanlan, Lewthwaite, and Jackson (1984) revealed that the best predictors of performance were competitive experience and prematch performance expectancies. It was also found that failure cognitions were significant predictors of win-loss in the first round. The relationship between performance expectancies and cognitions was not examined. Wilkes and Summers (1984) found that arousal and positive efficacy treatments produced significantly higher strength performance

on a leg strength task than imagery, attentional, or control conditions. However, these performance differences were not in conjunction with any consistent changes in cognitive states. Woolfolk et al. (1985) examined the effects of mental rehearsal and depiction of outcome on a golf putting task. The results revealed a significant outcome by trials interaction on performance of the task. It was found that negative outcome imagery degraded performance whereas positive outcome imagery did not enhance performance. Self-efficacy was found to be a less powerful predictor of performance than was previous performance. The imagery manipulation was not shown to have an effect on self-efficacy.

A number of studies have examined the role of cognitions in sporting contexts. Research by Mahoney and Avener (1977) suggests that gymnasts who were U.S. olympic team members made more self-instructional statements than did gymnasts who failed to make the team. Klinger, Barta, and Glas (1981) used a thought sampling method in their study of the thought content of Basketball players. Their research suggests that when a team is doing well, the athletes' thoughts focus on strategic and task focused thoughts. In contrast to this, when a team is not performing well, thought content becomes more self-evaluative. Gravel, Lemieux, and Ladouceur (1980) investigated the effects of a cognitive-behavioral treatment on competitive cross-country skiers. The results indicated that the treatment was effective in reducing the athletes' negative ruminations. However, the effects of the treatment on performance was not examined. Meyers, Schleser, Cooke, and Cuvillier (1979) found that physical practice groups had superior performance on

low and high difficulty gymnastics tasks than did the cognitive practice groups. Self-instructions and imagery practice resulted in little gain over simple communication of task requirements. The effects of the treatments on self-efficacy or cognitions were not examined. A problem with the study however was the possibility that the cognitive component reduced physical practice time. Other explanations included the brief training periods, young age of the subjects, and that self-instructions may interfere with difficult task performances. Hamilton and Fremouw (1985) used a cognitive-behavioral training program to improve free-throw performance in three college basketball players. The subjects averaged 72% in improved performance and changed their cognitions from 86% negative and 14% positive initially to 71% positive and 29% negative after training. A problem with the study was that only three subjects were involved. Long (1984) compared the effectiveness of an aerobic conditioning program to stress-inoculation training for the treatment of chronic stress. The treatments were conducted over a ten-week period involving 1.5 hours per week. The results indicated that both groups showed significant reductions in state and trait anxiety that were maintained or improved three months after treatments were terminated. Both groups also showed significant improvements in self-efficacy over the waiting control group. However, the results did not support Bandura's (1977a) view that performance based (i.e. the aerobic group) strategies result in stronger percepts of self-efficacy than verbal techniques (stress inoculation). The classification of the aerobic group as a performance based procedure may be questioned in that

performance should refer to a particular context, preferably one relevant to the subject sample in question.

In summary, a majority of studies in sporting contexts have supported Bandura's (1977a) contention that self-efficacy is a successful predictor of performances. In addition, the view that efficacy is a cognitive mediating mechanism has also received support. Studies investigating the role of cognitions in sport have indicated that successful athletes have more self-instructional and fewer negative statements than those who are less successful. Though studies have indicated the importance of self-efficacy and subjects' cognitions to performance, few studies have attempted to study the relationships between these factors.

B. Cognitive Assessment

This study compares several cognitive assessment procedures. THis section reviews the literature in terms of issues dealing with the validity of verbal report procedures and the problems and advantages associated with them.

As stated by Meichenbaum and Cameron (1981) cognitive assessment is primarily dependent upon the subjects' self-report. A number of procedures have been used in studies assessing subjects' cognitions including: interviews, questionnaires, projective techniques, thought sampling, retrospective videotaped reconstruction, thought-listing, and think-aloud protocols among them. The major difficulty with such

procedures is that one is unable to observe cognitions directly, thus, several authors have criticized the validity of these procedures.

In a controversial paper Nisbett and Wilson (1977) stated that a majority of the studies that they have reviewed suggest that subjects' self-reports are based upon their a priori theories regarding the causal links between stimuli and responses. In their view people, when trying to report on processes mediating the effects of a stimulus on a response, are unable to do so on the basis of true introspection. The authors suggest that accurate reports occur when stimuli are salient and plausible causes of the produced response are present.

Ericsson and Simon (1984) and Smith and Miller (1978) have noted that the studies reviewed by Nisbett and Wilson (1977) used flawed assessment procedures such as: extended time lag between the task and the assessment, procedures that involved minimal probing, and those lacking in proper retrieval cues. Nisbett and Wilson (1977) further stated that subjects have access to the products of mental processes but not to the processes themselves. As noted by White (1980) and by Klatzky (1984) it is at present difficult to distinguish between what constitutes a product and what constitutes a process, thus rendering their agrument unfalsifiable. Ericsson and Simon (1984) further add that many of the verbal reports discussed by Nisbett and Wilson (1977) could be stated without accessing memory, and that in several studies subjects were asked to report information that could not be given because it never way in memory in the first place (e.g. asking for causes).

In an effort to answer some of the questions brought forth by Nisbett and Wilson (1977), Ericsson and Simon (1980, 1984) developed a model based on information-processing theory. According to the authors, the accuracy of verbal reports is dependent upon the procedures used to elicit them as well as the relationship between the information asked for and the sequence of information heeded. The authors distinguish between: a) the time of verbalization which involves 1) reports constantly available to the subject while the report is made, 2) reports from information retained in short-term memory, and 3) reports of information from long-term memory; and b) procedures where conscious content is directly verbalized (level 1 verbalization) versus procedures where stored information is input to intermediate processes such as inference or abstraction (levels 2 and 3). According to the authors, accurate verbal reports are possible particularly where the time between the event and report are minimal. Reports that validly reflect information processes will be in such cases as when information is heeded and does not require further encoding.

Klatzky (1984) reports two senses of a report's accuracy: 1) the valid description of information processing activities that are to be reported; and 2) expressing what is consciously experienced without regard to its source. The present study is concerned with verbal reports in the latter sense wherein one is concerned with the subjects' frame of reference, their conscious content, as opposed to the issue of whether or not the self-report is a valid representation of processing activities related to the task at hand.

Thought-listing is a retrospective procedure in which subjects are asked to verbalize or, more commonly, to write down their thoughts after performing the task in question. According to Cacioppo and Petty (1981), the thought-listing procedure is less likely to interfere with performance and is easier to administer in groups than think-aloud procedures. A possible difficulty with this procedure is that it may encourage subjects to reconstruct, rationalize, or confabulate about the event of interest (Meichenbaum & Butler, 1979). Ericsson and Simon (1984), indicate that this problem will be minimized if the verbal report is provided immediately after the event of interest. Cacioppo and Petty (1981) stated that asking subjects to report all their thoughts produces different reports than when subjects are asked to list their thoughts on a particular topic, with the latter producing reports that are more relevant to the topic of interest. Two primary methods of unitizing cognitive responses are through the use of judges who have a predetermined criteria such as content (a single idea) and by having the subjects separate the thoughts themselves. The latter is the more common with thought listing methods (e.g. see Petty & Cacioppo, 1977; Blackwell et al., 1985).

Videotape stimulated recall procedures involve videotaping subjects performing a task and having them recall their thoughts retrospectively or to reconstruct their thoughts at the time by reliving the event in question. It may also be possible that recognition processes are also involved. As noted by Genest and Turk (1981), one advantage of this procedure is that the interference of data gathering with the task is

reduced. Though it has been argued that the videotaping acts as a cue facilitating more veridical recall (Meichenbaum & Butler, 1979), it may also be that it increases the possibility of confabulation. In addition, subjects performing tasks such as those found in sporting contexts may try to use the feedback from the replay to enhance future attempts thus possibly interfering with the verbal report. The technique has been used in the clinical and educational settings to increase our understanding of client, student, teacher and therapists processes (Sheehan, McConkey, & Cross, 1978; Conners, 1977).

Think aloud methods have been criticized on several accounts: 1) verbalizations that occur concurrently with thoughts of interest may alter these thoughts; 2) the report may be incomplete with the subjects reporting only a part of what is passing through short term memory; and 3) in certain instances several thoughts may occur simultaneously with the subject only reporting a few of them (Ericsson & Simon, 1984). Klatzky (1984) adds that in the case of physical tasks and in particular those that are well rehearsed or that have become automated, thoughts may interfere with the task of interest by slowing ~~it~~ down to match the verbalization. Klatzky further states that this will not occur in instances where one does not try to synchronize the thoughts with the process under investigation. To this Genest and Turk (1981) add that the processes underlying automated behaviors may not be accessible for verbalization. In spite of these possible drawbacks, the major advantage is that the report is concurrent with the thoughts of interest

thus minimizing the possibility of forgetting or of post hoc rationalization (Glass & Arnkoff, 1982).

Few studies have compared cognitive assessment methods and as noted by Glass and Arnkoff (1982) there is a further need for research in this area. Galassi, Frierson, and Sharer (1981), using a structured questionnaire, compared retrospective with concurrent procedures for subjects taking a business exam. Their findings indicated no significant differences between the two procedures on the number of positive thoughts, negative thoughts, body sensations or subjective units or distress (suds) levels. The results also suggested no interference effects of the concurrent assessment. The only significant differences found were with a group assessed as the beginning of the exam who differed on two of seven negative thoughts and three of six different positive thoughts. The authors advised caution in generalizing their results to more open-ended procedures. A more recent study by Blackwell et al. (1985) compared thought-listing with think-aloud procedures on subjects solving mathematics problems. The think-aloud procedure produced twice as many thoughts as thought listing. Thought-listing produced significantly more thoughts in the positive self-evaluation and positive problem solving evaluations. Thinking-aloud produced significantly more thoughts involving conclusions, review of information, attention control, and strategic calculations.

Theorists have suggested that concurrent cognitive assessment procedures have a major advantage over retrospective methods in that they minimize the possibility of forgetting or post hoc rationalization.

In contrast, retrospective methods, while being more reliant on memory processes, have the advantage of minimizing task interference. Studies that compare cognitive assessment procedures have revealed that concurrent and retrospective methods do produce different data and highlight the necessity of further study in this area. This is particularly true of studies assessing cognitions in sporting contexts where few studies have compared assessment methods.

# CHAPTER III

# METHOD

## A. Subjects and Performance Task

The subjects are male and female undergraduate students attending The University of Alberta, participating in Physical Education 229 (Introduction to Track and Field II) winter session 1986 for credit (N-42) (13 females, 29 males). All students learned to vault using teaching progressions developed by Simonyi (see Appendix A). This involves subjects moving from relatively simple tasks (sliding the pole, learning the planting movements) to more difficult tasks (learning to takeoff and ride the pole, to full attempts). There were three testing sessions; during the third, sixth, and eighth classes out of a total of nine sessions, each fifty minutes in length. During these sessions subjects were allowed to attempt any height they wished.

## B. Dependent Measures

### Self-Report Measures

The Jumping Efficacy Scale (JES) was adapted from Feltz's (1982) Diving efficacy scale (see Appendix C). Subjects were asked to rate the strength of their belief in being able to perform a given task at the time. The 100 point probability scale is in 10 unit intervals ranging

from great uncertainty to complete certainty. Feltz et al. (1979) reported a test-retest reliability of r=.98 with a sample of 7 in a one-week interval. In the present study self-efficacy was measured just prior to the athletes' attempts.

The Background Questionnaire contains questions concerning age, gymnastics and jumping experience, other sports involvement, injuries, recent medication, and recent exercise, (i.e. factors which may influence the variables under study) (see Appendix D). Subjects were also asked for information regarding injuries, medication-general state of health, and recent exercise each time data was collected.

Performance

Performance was measured by the course instructors combining the height attempted with a descriptive categorization of the attempt. The descriptive categories are as follows: (a) Failure as denoted by: 1) run throughs, 2) balking--the jumper brakes hard at takeoff but doesn't leave the ground, 3) an aborted attempt--the jumper leaves the ground but does not continue the attempt, 4) a failed clearance attempt; and b) successful clearances. Inter-rater agreement for all attempts during the first period (64 attempts) was 1.00.

Subject Cognitions

A retrospective thought listing procedure was used to obtain a written record of the subjects' thoughts while they were learning the pole vault task. Upon completion of an attempt the students completed

the thought listing forms provided. The thought listing forms asked subjects to place their thoughts in three temporal categories; 1) prior to being called upon to make an attempt; 2) from the moment they are called to the completion of their attempt; and 3) immediately after their attempt (see Appendix C for a sample form). The protocols were unitized by the subjects who separated their thoughts from each other by placing a dash before each thought (a procedure similar to that utilized by Petty & Cacioppo, 1977). The data were first categorized into positive, neutral, and negative (representing a polarity dimension; Cacioppo & Petty, 1981) according to the following criteria:

1. Positive thoughts reflect a favorable disposition toward the task or one's participation in it. Evaluative statements indicating one's performance as good or one's strategies as correct or effective, statements indicating self-confidence, viewing the task as easy, as well as statements of positive affect are included in this category.
2. Neutral thoughts include: statements which are ambiguous, self-statements indicating attentional focus on the task, analytical statements without an evaluative component, and expressions of hope.
3. Negative statements include: negative evaluation of one's abilities, physical or mental state, or one's performance in the task. Negative evaluation of one's strategies as incorrect or ineffective, viewing the task as difficulty, a lack of self-confidence, as well as statements of negative affect.

All protocols were categorized by the experimenter with twenty protocols chosen at random for further categorization by an independent rater. for 667 statements inter-rater agreement was .88 with Kappa of .80.

A further analysis involved categorizing the statements according to the following criteria:

1. Self-instructional statements indicate attentional focus. They include statements directing the self to execute the task or to focus on the execution of a particular aspect of the task. It also includes efforts to cope with negative affect or attitudes.
2. Evaluative-analytic statements include evaluation of one's abilities, performances, and physical and mental states.
3. Confidence statements are evaluations of ability, or lack of ability to perform the task.
4. Attitude reflects one's mental disposition towards the task; viewing the task as easy or difficult, or indicating one's desire or lack of desire to perform.
5. Affective statements describe one's feelings. They include statements indicative of feelings of excitement, nervousness, happiness, frustration, anger, and disappointment, among others.
6. Neutral statements include expressions of hope, confirmatory remarks, as well as other statements that are primarily descriptive.
7. Imagery.
8. Irrelevancies are thoughts not related to the task.

In order to corroborate the data collected via the thought-listing method as well as to compare the kinds of data that can be gathered using other methods, a sub-sample of nine subjects (five for the "think-aloud," four for the "stimulated recall") volunteered from the two classes to be tested between the second and third testing occasions using think aloud and videotaped stimulated recall procedures. Subjects from both these groups were tested individually in the presence of others who were practicing but were not part of the testing procedure.

Subjects in the think-aloud group were asked to verbalize their thoughts aloud concurrently for the duration of the session. The subjects' thoughts were recorded using an AZDEN WMS-10 wireless microphone system with the receiver attached to a Sony TCM-6 cassette recorder.

Subjects in the stimulated recall condition followed the same procedures as in the thought listing condition except that they were videotaped for each trial and their thoughts recorded on audio tape. Upon completion of a trial, the students viewed themselves before, during, and just after their attempts. While doing so they were asked to verbalize their thoughts and images concurrently with watching themselves. The specific instructions for the thought-listing, think-aloud, and stimulated recall procedures are given in Appendix B.

For the think-aloud and stimulated recall conditions the subjects' thoughts were separated on the basis of content--changes in content denoted a new thought. The data were then categorized according to the criteria established for the thought listing procedure.

C. Procedures

On the occasion of the first class students were informed as to the nature and purposes of the study. Subsequently, one month prior to the commencement of the study proper the procedures were tested by using two university team members (pole vaulters) and four subjects from the two physical education classes (using triple jump as the task). The purpose was to determine the appropriateness of the measures used, their clarity and ease of understanding, as well their suitability to the purposes of the study. From this preliminary study it was determined that time constraints (class length of 50 min.) and the number of subjects involved (20-25 in each class) precluded the use of think-aloud and videotaped stimulated recall procedures during the class.

On the occasion of the first pole vaulting class the testing procedures were outlined. At this time the subjects were provided with the opportunity to ask questions about the study and testing procedures. The subjects were then provided with a detailed description of the event including a videotaped replay of pole vaulting by experts taken from highlights of the 1984 Olympic Games. At the end of the first class subjects filled out a sample self-efficacy form, and background questionnaire.

The study proper began on the occasion of the third class in which subjects attempted heights for the first time. Testing was conducted on the third, sixth, and eighth classes. Subjects who missed a class were tested during the next class.

The following describes the procedures for one session:

1. At the beginning of a class folders containing the data collection forms were distributed.
2. The subjects completed the relevant parts of the background questionnaire.
3. The subjects completed the jumping efficacy form (where tasks are arranged hierarchically).
4. Immediately prior to performing, subjects rated the strength of their efficacy to perform the jump by checking the appropriate box on the jumping efficacy scale as well as indicating the height which they were attempting.
5. Upon completion of the JES, the subject completed the task.
6. An ongoing record of the subjects' performances was kept by the instructors.
7. Upon completion of the attempt the subjects wrote the thoughts that they had just before being called to perform, the thoughts present after completing the JES scale until they finished their attempt, and those immediately after their attempt.
8. The above procedures (4-7) were repeated for each attempt. Data were collected three times, providing an ongoing record of the subjects' thoughts, self-efficacy, and performance.

## D. Treatment of the Data

This study involved exploring the relationships between perceived self-efficacy, performance, and thoughts among undergraduate university

students while learning to pole vault. The data analysis was conducted in accordance with methods described by Tukey (1977). According to Maguire (1986), and further emphasized by Diaconis (1985), exploratory techniques focus on the creative, reflective, and interactive aspects of the research process involved in one's attempts to reveal the structure and descriptions of the phenomenon of interest. These proceudres encourage both the confirmatory and discovery processes.

Box and whisker displays were used for data presentation. Total number of attempts, number of successes, number of failures, and average self-efficacy scores were among the data presented. These displays allowed for the subjects to be easily categorized into high, middle, and low performance groups as well as according to sex. Comparisons among these groups were carried out according to self-efficacy ratings and patterns of cognitions. General trends as well as exceptions were noted and described.

Performance was measured in terms of the maximum height cleared and the proportion and number of successes and failures.

Self-efficacy was measured using the jumping efficacy scale which measures both the level of efficacy (the task or height to be attempted) and the strength of efficacy (one's evaluation of being able to perform at that level).

Thoughts were treated as categorical data. For the purposes of analysis the students' thoughts were coded into content categories similar to that utilized by Blackwell et al. (1985), in their comparison of think-aloud and thought-listing techniques. Initially, the thoughts

were categorized as negative, positive, and neutral. The coded data were then related to the subjects' self-efficacy ratings and their performance to determine if any trends existed. In comparisons between groups, the analysis focused (arbitrarily) on differences in proportions of .05 or greater. Care was taken to note proportions that were unduly influenced by exceptional scores. The relationships between self-efficacy and past performances with subsequent performances were examined first by the use of the Pearson correlation coefficient with performance being treated as a dichotomous variable (success or failure). These procedures are in accordance with the suggestions of Cervone (1985) and Lee (1985). The predictive ability of self-efficacy during the first testing occasion was compared with that for the second and final testing sessions. In addition, average self-efficacy scores were correlated with performance as measured by proportion of successes and maximum performance.

## CHAPTER IV

## RESULTS AND DISCUSSION

### A. An Overview of the Data Focusing on Sex Differences

The box and whisker displays in Figure 1 show the total number of attempts taken by the subjects during all three testing occasions. The medians for number of attempts are 8 for the gourp as a whole and for males and females considered separately. It is interesting to note that there is little difference between the sexes in the number of attempts.

Figure 2 focuses on the subjects' number of successes. The median for the gorup as a whole is 2; the median for female subjects is 1 and for males it is 3. Here sex differences are apparent, the median values differing by 2, with the median value for males at the value of the females' upper quartile. The results are similar when considering total number of failures.

Figure 3 shows that overall the subjects' scores center around 5. The females' median score is 7, the males' is 4. These results indicate differences in performance between male and female subjects when using total number of successes and failures as criteria.

One can also evaluate performance in terms of proportions of the number of successful attempts to the total number of attempts. This will tend to even out differences because of differences in total attempts.

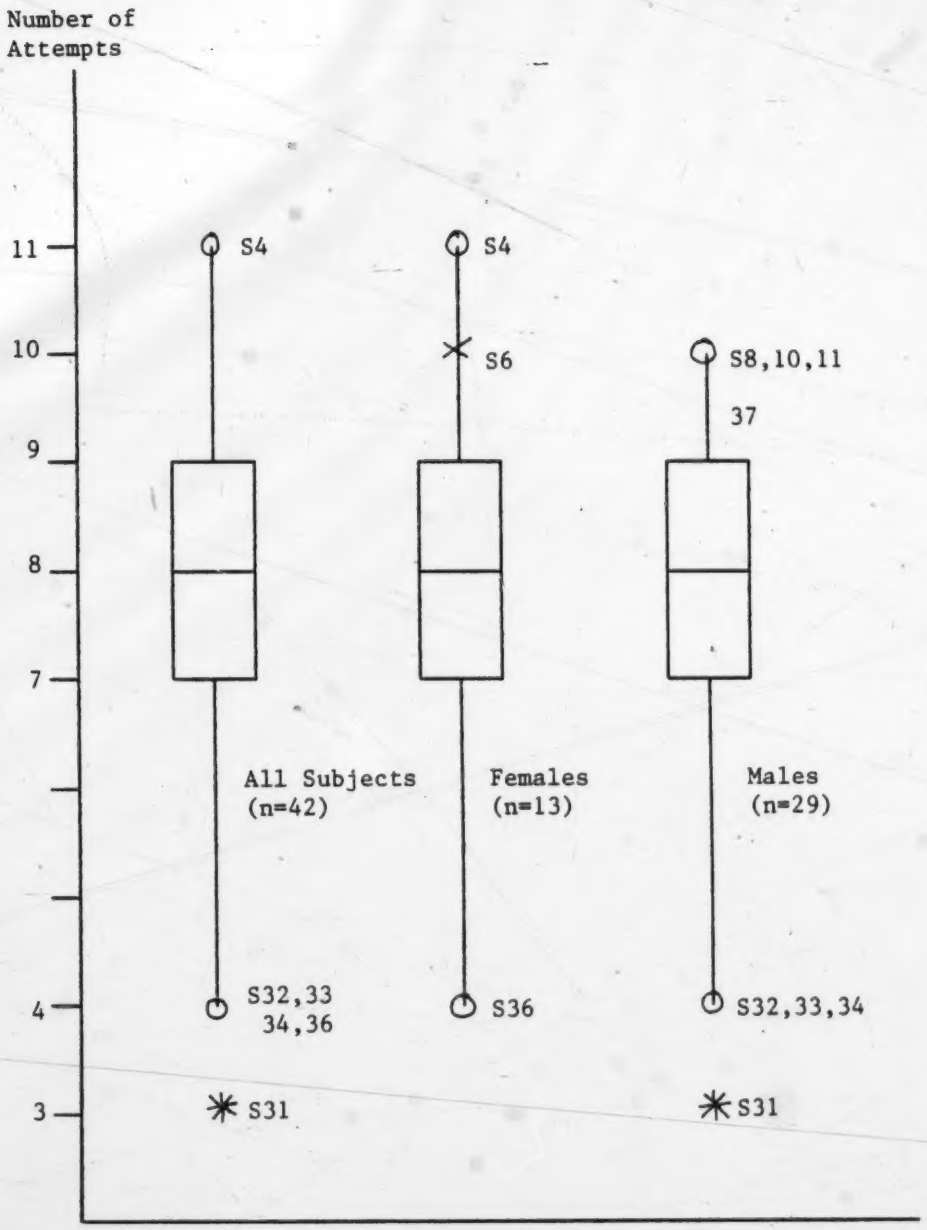


Figure 1. Total Number of Attempts for All Subjects, Females, and Males.

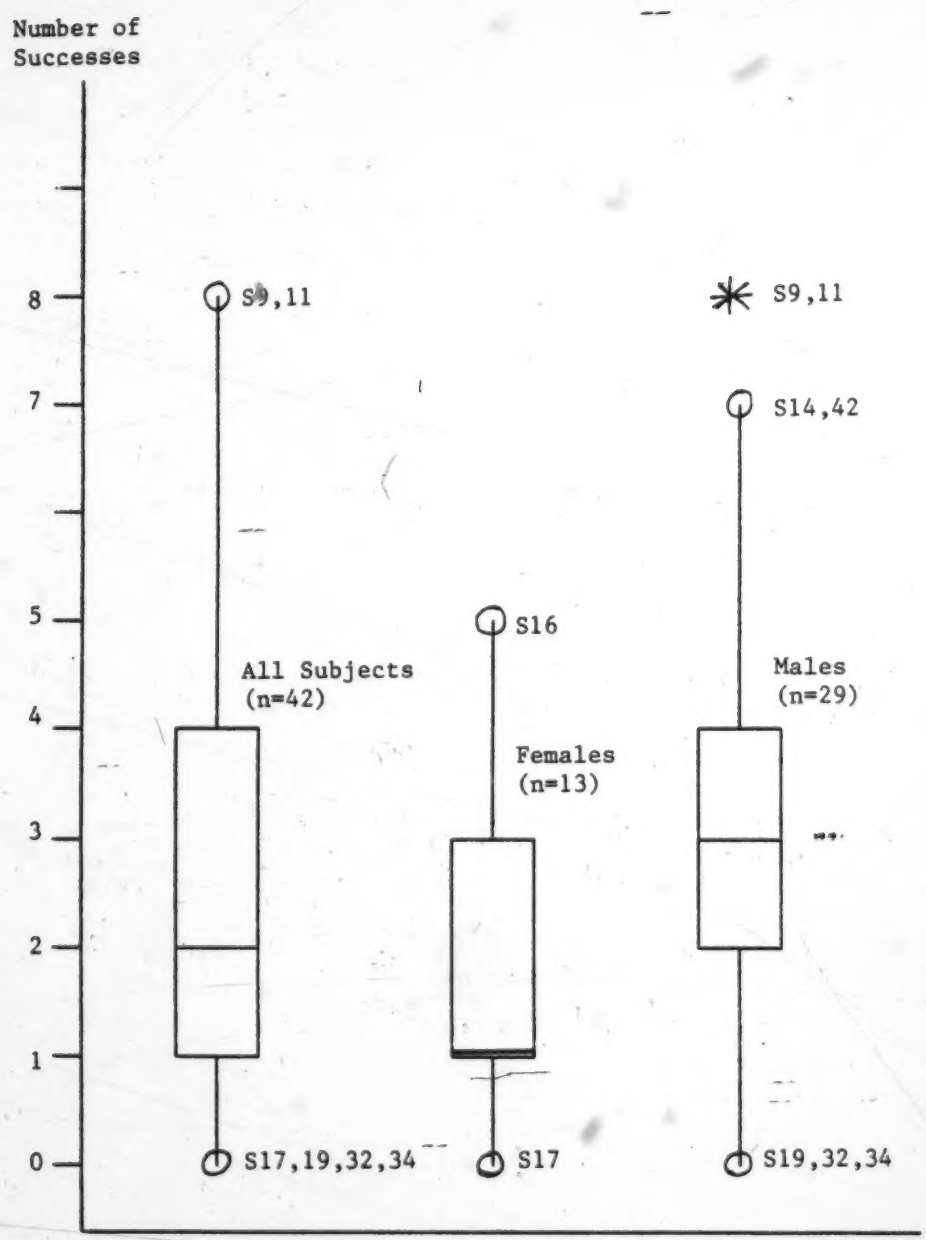


Figure 2. Total Number of Successes for All Subjects, Females, and Males.

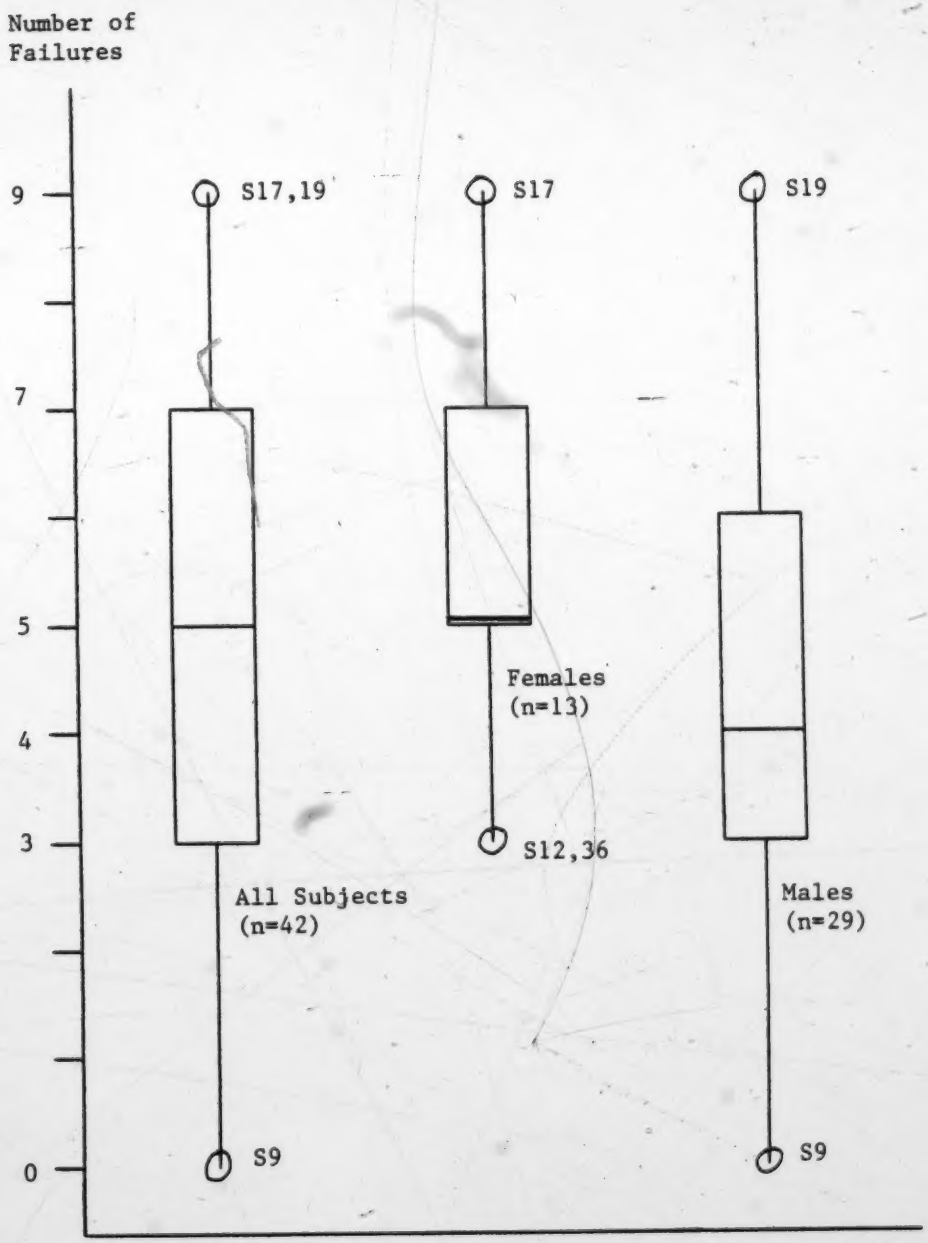


Figure 3. Total Number of Failures for All Subjects, Females, and Males.

Figure 4 indicates that for the group as a whole the median proportion of success was .37. The displays also suggest differences between male and female subjects in this regard with the medians being .20 for females and .40 for males. This difference is striking, considering that the upper quartile for the females (.36) is not even as high as the mediam value for males (.40). In fact the highest proportion for females is .56. These differences are also clear when considering maximum performance (Figure 5). The display indicates that for females the scores range from 0 to 2.20 meters, and for males the range is 0 to 3.10 meters.

In summary, when considering number of attempts, differences between the sexes is negligible whereas for all three measures of performance, sex differences are notable. The results of Figure 5 are not particularly surprising or interesting when considering the fact that two of the most important requirements for the event are speed and strength factors in which males are generally superior. It is possible that the differences between the sexes in terms of success/failure, and in proportion of successes, can also be partially explained by males' physical superiority.

B. Self-Efficacy Data

Figure 6 shows the average self-efficacy scores of the group as a whole and the group divided according to sex. The median of self-efficacy scores was 53.5 for the group as a whole, 55 for males, and 37 for female subjects. As with performance, the differences between male

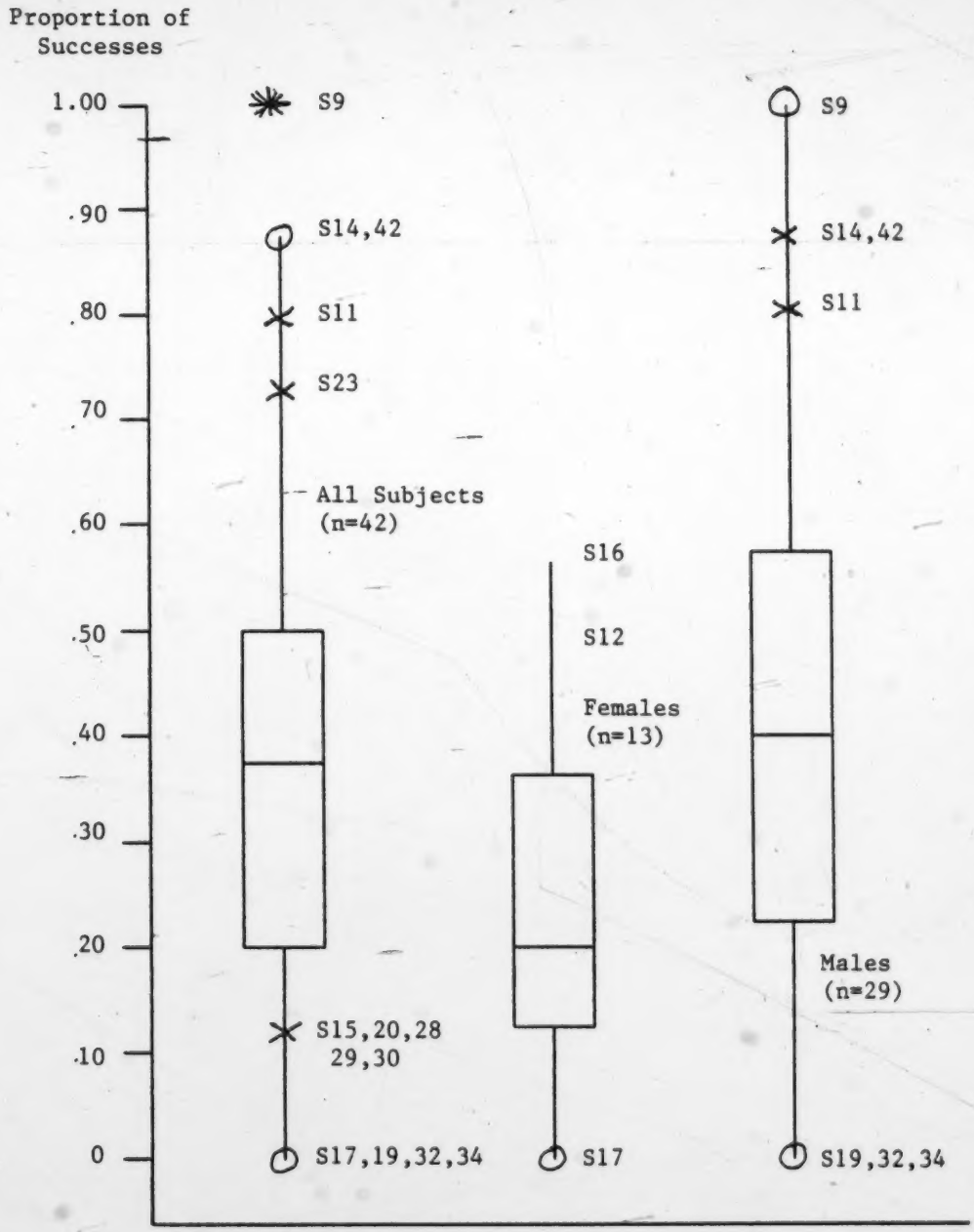


Figure 4. Proportion of Successes for All Subjects, Females, and Males.

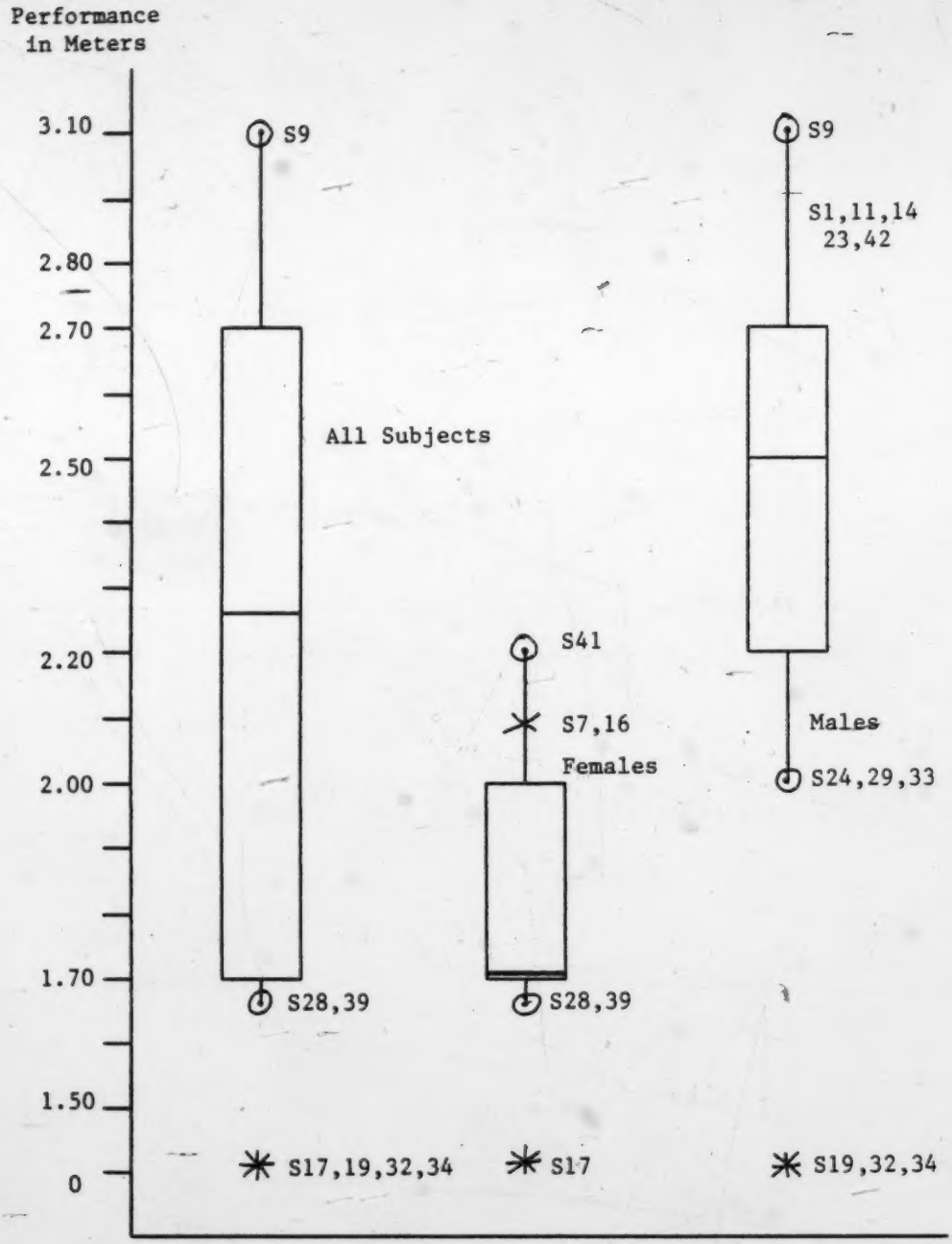


Figure 5. Maximum Performance All Subjects, Females, and Males

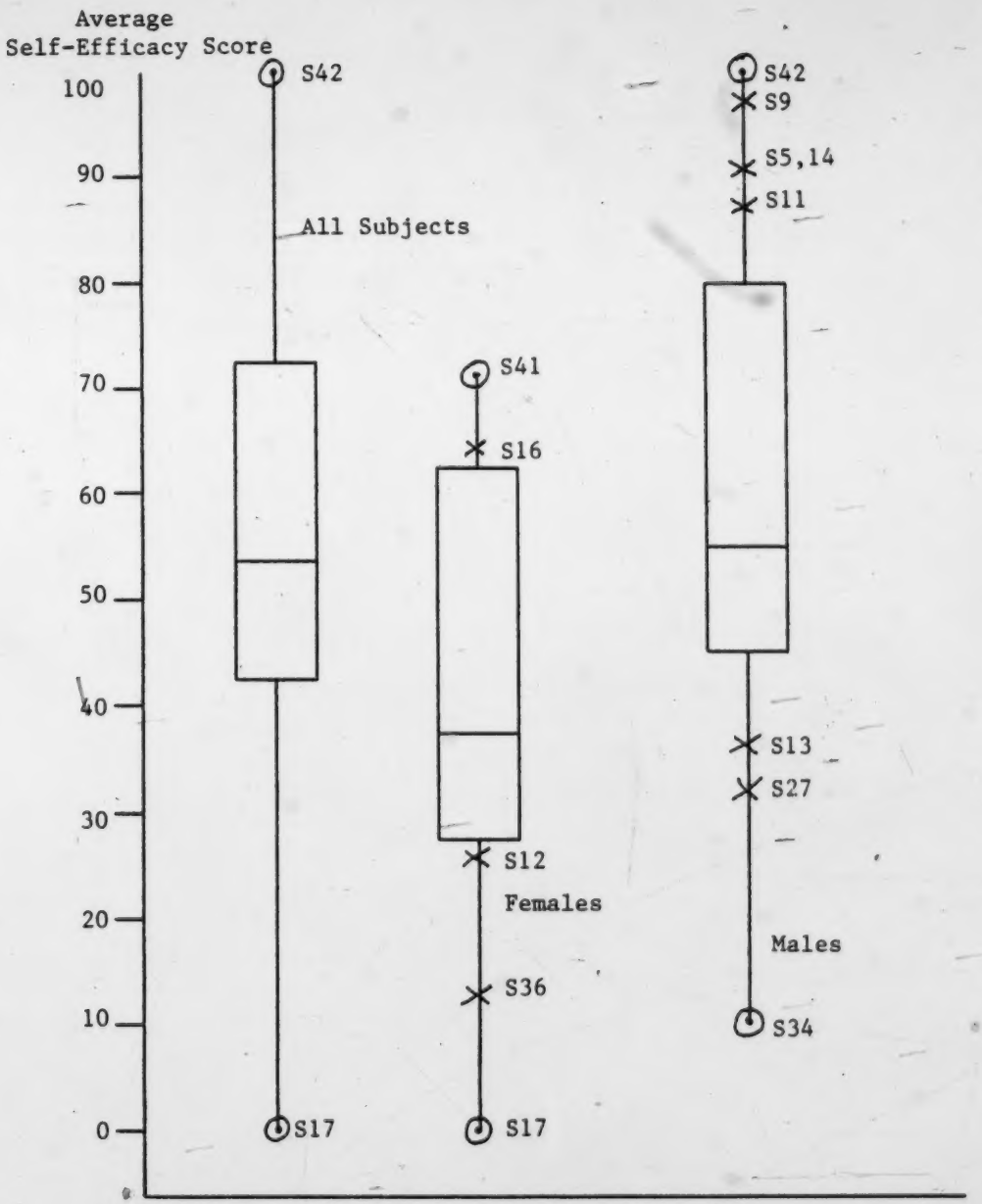


Figure 6. Average Self-Efficacy Scores for All Subjects, Females, and Males.

and female subjects in average self-efficacy ratings are striking. Eleven of the males' scores (n=29) are higher than the highest score by a female subject and conversely, seven of the ten lowest scores are by female subjects (n=13). (Tables with the five number summaries for Figures 1 through 6 are provided in Appendix E).

Evidence provided in Chapter II indicates that the majority of studies support the idea that self-efficacy and performance bear a close correspondence to each other. Table 1 contains the correlations between average self-efficacy levels and performance as measured by proportion of successes and maximum performance. Overall, the correlations between the two variables is moderate, .66 between proportion of successes and efficacy and .54 between efficacy and maximum performances. These results provide support for the hypotheses that low expectations are associated with poorer performances and conversely that higher efficacy expectations are associated with higher performances. The table also shows differences between male and female subjects in self-efficacy to performance correlations.

For female subjects the correlation between self-efficacy (Seff.) and proportion of success (Psucc.) is .51, for Seff. and maximum performance (Pmax.) the correlation is .74 as compared with correlations of .65 and .40 respectively, for the male subjects. Though these correlations could be influenced by one exceptional score, a look at the scatter plots showed that this was not the case. A possible explanation is that female subjects may tend to be more realistic in their appraisals of their confidence in being able to perform when considering

Table 1

Correlations Between Average Self-Efficacy Scores and Proportion of Successes (PSucc.) and Maximum Performance (PMax.)

| | $\overline{\text{Seff.}}$-PSucc. | $\overline{\text{Seff.}}$-PMax. |
|---|---|---|
| Total (N=42) | .66 | .54 |
| Females (n=13) | .51 | .74 |
| Males (n=29) | .65 | .40 |

maximum performance as the criteria. Maccoby and Jacklin (1974) have suggested that males tend to overestimate their levels of self-confidence, while more recent research by Corbin, Landers, Feltz, and Senior (1983) indicates that it is female modesty rather than male boastfulness that accounts for the differences and that the lack of confidence in specific motor abilities may account for females' low performance estimates. In this regard males would tend to overestimate their abilities. The evidence in Table 1 lends support to this idea as the correlation for efficacy and maximum performance is .74 for female and .40 for male subjects. Thus female subjects may be making realistic appraisals of their confidence in being able to vault. Efficacy expectations are stronger predictors of performance for male subjects if we consider proportion of successes as the criteria of performance (.65 vs. .51). These differences do not reach significance at the .05 level using the Fisher's Z transformation. In this respect the possibility

that the sexes differ on which measure of performance they emphasize when making efficacy predictions is purely speculative.

The correlation between efficacy expectations and performance (success or failure) for each attempt is given in Table 2 for each testing date. At all times self-efficacy was a stronger predictor of performance than were previous performances. This evidence is contrary to the hypothesis that performances are a stronger predictor of subsequent performances than is self-efficacy, in the initial stages of learning the task. However the result does indicate that self-efficacy operates as both a cause and an effect. The results show that the relationships were strongest for the first testing occasion time, T1, decreased at time T2, and rose slightly at time T3. One cannot discount the possibility that these results may be accounted for by the relatively few attempts taken at T1, 69, as compared with 122 at T2 and 131 at T3. Subjects at time T1 had so few attempts that there was little opportunity for improvement to occur.

In support of this conjecture, the majority of people who failed on their initial attempt also failed their subsequent attempts (16 out of 18), whereas subjects who succeeded on the first attempt were almost equally likely to fail as they were to succeed on their next attempt (5 out of 9). Thus the results neither confirm nor reject the hypothesis that over time self-efficacy becomes an increasingly stronger predictor of performances.

Table 2

Correlations Between: Self-Efficacy and Performance (Success or Failure) ($Seff_1$-$P_1$), Consecutive Performances ($P_1$-$P_2$), Performance and the Next Self-Efficacy Rating ($P_1$-$Seff_2$), and Between Consecutive Efficacy Ratings ($Seff_1$-$Seff_2$), at Each of the Three Testing Occasions ($T_1$, $T_2$, $T_3$)

| | $T_1$ | $T_2$ | $T_3$ |
|---|---|---|---|
| $Seff_1$-$P_1$ | .48 | .37 | .38 |
| $P_1$-$P_2$ | .38 | .12 | .14 |
| $P_1$-$Seff_2$ | .44 | .24 | .34 |
| $Seff_1$-$Seff_2$ | .91 | .88 | .89 |
| Number of Attempts | 69 | 122 | 131 |

C. Subjects' Cognitions

The subject's cognitions were initially classified as positive, negative, or neutral. The results for all attempts, successful attempts, and for failures appear in Table 3 as averaged proportions. The results show little difference in the proportion of thoughts classified as neutral for both successful (.50) and failed (.51) attempts. The finding that .37 of the thoughts were positive for successful clearances and .13 for failed attempts is not different from what one may expect as is the finding that .12 of the thoughts were negative for successful clearances and .36 for failures.

Table 3

Proportions of Cognitions as Measured on the Polarity Dimension for Successes, Failures, and Total Attempts

| | Positive | Neutral | Negative | (No. of Attempts) | (No. of Thoughts) |
|---|---|---|---|---|---|
| Successes | .33 | .51 | .16 | 125 | 543 |
| Failures | .14 | .54 | .32 | 197 | 878 |
| Total | .21 | .53 | .26 | 322 | 1421 |

After the subjects' cognitions were classified as positive, negative, or neutral, they were further classified as belonging to one of eight categories; self-instructional, evaluative, confidence, attitude, affect, neutral, imagery, and irrelevant. The results for the total, failed, and successful attempts appear in Table 4. The results show no differences in the proportions between clearances and failures in terms of attitude, self-instructional, and affect statements. Subjects had proportionately more evaluative, confidence and neutral statements on successful attempts.

One interesting finding is that only two instances of imagery were reported, though all respondents stated that they used imagery during their performances. It may be that the instructions did not emphasize the importance of reporting that type of cognition, or perhaps subjects had difficulty in converting their images to verbal responses. Ericsson and Simon (1984) have suggested subjects will encounter difficulty if required to convert thoughts to another mode.

Table 4

Proportions of Cognitions for Successes, Failures, and Total Attempts. (Si=Self-Instructional, Ev=Evaluative, C=Confidence, Att=Attitude, Aff=Affect, N=Neutral, Im=Imagery, Irr=Irrelevant)

| | Si | Ev | C | Att | Aff | N | Im | Irr |
|---|---|---|---|---|---|---|---|---|
| Successes | .26 | .26 | .14 | .06 | .12 | .16 | .001 | .004 |
| Failures | .26 | .34 | .08 | .06 | .12 | .12 | .001 | .001 |
| Total | .26 | .31 | .11 | .06 | .12 | .13 | .001 | .002 |

D. Approach and Avoidance Behavior

Figure 1 shows that there are no appreciable differences between males and females in the number of attempts. It also shows a number of subjects 31, 32, 33, 34, and 36 who made four or fewer attempts. It is possible these subjects display avoidance behavior. As a group these subjects had .12 positive, .55 neutral, and .33 negative thoughts. These subjects had only four clearances among them out of 17 attempts with only one subject (33) having .50 successes. In addition their average self-efficacy levels were 53 (S31), 42 (S32), 42 (S33), 10 (S34), and 12 (S36). In particular subjects 34 and 36 had large proportions of negative thoughts .75 and .44 respectively and few positive thoughts .00 and .06 respectively. Subject 34's thoughts indicated fear, e.g. "thought of falling from a height in junior high school; self-depreciation, "I could have high jumped this height;" and a

lack of confidence, "never going to make it." Subject 36 had thoughts characterized by a lack of confidence, "I'm not going to make it," "There's no way." Both subjects also had proportionately high, .57 and .44 evaluative statements. Thus considering their thoughts and self-efficacy scores, subjects 34 and 36 could be characterized as displaying avoidance behavior.

The other three subjects in the group had injury problems and only participated in two testing occasions which reasonably accounts for their lack of participation but it is also interesting to note four subjects had few thoughts in the self-instructional category S31 (.11), S32 (.17), S33 (.07) and S34 (.14) as compared with .26 in all subjects together. Instead of focusing on what they had to do next, these subjects' thoughts tended to reflect fear, worry, and negative aspects of their performance.

If we can accept that there is some limited support for the idea that subjects who make few attempts may be displaying avoidance behavior, it is also possible that those subjects making large numbers of attempts tend towards approach behavior. Figure 1 indicates that six subjects had substantially more attempts than the other subjects (ten or more). Their self-efficacy averaged 68. Four subjects in this upper group had thoughts characterized by lower than the average proportions in positive and negative statements; S37 (.18, .10), S8 (.16, .23), S10 (.24, .18), and S6 (.16, .09). The other two subjects S4 and S11 had comparatively more positive thoughts .54 and .49 respectively, than their counterparts. Subject 4's thoughts reflected task focus, "I have

to go fast and drive my right knee up at takeoff," .35 of her statements were self-instructional, and self-talk statements indicative of confidence and coping, "Try hard, think positive." Subject 11's cognitions were primarily either positive (.49) or negative (.38) and tended to reflect the subject's feeling states, "feels good," "a little nervous," with comparatively few statements that were self-instructional (.08) or evaluative (.18).

Two subjects had relatively high proportions of self-instructional and evaluative statements, S6 (.40, .43) and S8 (.34, .48). These subjects' thoughts indicated an analytical style, e.g. S6 "Well, I was straighter this time" and even when feeling states were indicated, evaluations were being made, e.g. S8 "felt good, except for loss of speed." Subjects 37 and 10 were not overly negative (.10, .18) nor positive (.18, .24) and similarly emphasized instructional and evaluative thoughts but also made more statements describing their confidence levels. In summary, the thoughts and self-efficacy of subjects who made relatively few attempts may be indicative of avoidance behavior while those of subjects making many attempts is not as overtly suggestive of approach behavior.

Figures 2, 4, and 5 present data regarding the performance of the subjects in terms of number and proportions of successful attempts and maximum performance. Considering both male and female subjects grouped together, subjects S16, S41, S9, S11, S14, and S42, can be collectively placed in an upper group. Similarly, subjects S17, S19, S32, S34, S39, S28, S24, S29, and S33 can be placed in a lower group in terms of their

performances. Placing subjects in these groups allows one to consider if there are common factors which distinguish these two groups from each other.

E. Results of the Upper Group

The upper group's performances as measured by both proportion of successes and maximum height cleared are as follows: S16 (.56, 2.10 m), S41 (.29, 2.20 m), S9 (1.00, 3.10 m), S11 (.80, 2.80 m), S14 (.87, 2.80 m), S42 (.87, 2.80 m). It is interesting to note that these subjects also have among the highest self-efficacy score averages; S16 (64), S41 (71) having the two highest averages for female subjects and S9 (96), S11 (87), S14 (90), and S42 (100) having four of the five highest scores for male subjects. Four subjects S9, S14, S16, and S42 are members of varsity teams though none is a pole vaulter. The upper group's thoughts classified as positive, neutral, and negative averaged together are .21 positive, .59 neutral, and .17 as negative (see Table 5). These results may suggest that in general this group shows emotional control, and neither excessive positive nor negative affect. Table 6 shows that overall subjects had .12 affect laden thoughts. Similarly the subjects in the upper group averaged .12 in this category. Most of this can be attributed to the effects of subject 11 who had .38 of his thoughts in this category. Removing his score from the average produces a .06 average for the other five members.

Four subjects displayed relatively high proportions of self-instructional and analytical-evaluative thoughts S9 (.35, .38), S14

Table 5

Proportions of Thoughts Along the Polarity Dimensions for Upper, Lower, and Middle Groups

| | Positive | Neutral | Negative |
|---|---|---|---|
| **Upper Group (n people = 6; n thoughts = 224)** | | | |
| Successes | .24 | .54 | .22 |
| Failures | .11 | .68 | .20 |
| Total | .21 | .59 | .17 |
| **Lower Group (n people = 7; n thoughts = 210)** | | | |
| Successes | .27 | .59 | .14 |
| Failures | .12 | .58 | .30 |
| Total | .13 | .58 | .29 |
| **Middle Group (n people = 29; n thoughts = 987)** | | | |
| Successes | .37 | .50 | .13 |
| Failures | .16 | .51 | .33 |
| Total | .24 | .50 | .26 |

Table 6

Proportions of Thoughts as Classified in Eight Categories (Self-Instructional, Evaluative, Confidence, Attitude, Affect, Neutral, Imagery, Irrelevant) for Upper, Lower, and Middle Groups

| | Upper Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Si | Ev | C | Att | Aff | N | Im | Irr |
| Successes | .27 | .27 | .08 | .07 | .13 | .15 | .006 | .02 |
| Failures | .35 | .26 | .06 | .06 | .10 | .16 | | .01 |
| Total | .29 | .26 | .07 | .07 | .12 | .15 | .003 | .01 |
| | Lower Group | | | | | | | |
| | Si | Ev | C | Att | Aff | N | Im | Irr |
| Successes | .32 | .27 | .09 | .09 | .04 | .11 | | .04 |
| Failures | .36 | .31 | .08 | .04 | .09 | .11 | | |
| Total | .35 | .31 | .08 | .05 | .08 | .11 | | .005 |
| | Middle Group | | | | | | | |
| | Si | Ev | C | Att | Aff | N | Im | Irr |
| Successes | .23 | .27 | .16 | .06 | .12 | .17 | | |
| Failures | .25 | .35 | .10 | .07 | .11 | .12 | .002 | |
| Total | .24 | .32 | .12 | .07 | .11 | .14 | .001 | |

(.40, .50), S41 (.65, .17), S42 (.43, 0). These subjects' thoughts were characteristically short, specific, and tended to focus on a few specific aspects of the task: S9 "good fast run," "still no rock-back;" S14 "To make sure I plant right," "I planted wrong;" S41 "kick your feet up," "that the standards were too close to the pit." Also, these subjects congratulated and reinforced themselves for successful performances, e.g. S41 "alright! Good jump" and S9 "very good run," indicated eagerness to jump, S42 "want to raise the height," S14 "thought I jumped well," and S11 "eager to jump." Subject S11 differed from other members in this group in that his statements focused on affect (.38) "didn't feel quite right" and "excited but worried" and confidence (.31) "got my confidence back now."

Subject 16's thought statements are perhaps best described in terms of Nideffer's (1976) broad internal and external focus; this individual attends to a great deal of information as reflected by a large amount of self-talk, reporting 71 statements over nine attempts, e.g. "I'm going to eat dust after this," "Running, Running, do you know that you are in my way. Does he know?", "See what victory does to you. It makes us smile because we think that everything is wonderful because of this single incident." While such a large amount of self-talk may lead one to wonder whether it would interfere with one's ability to perform, the subjects' results do not appear to suffer though it may be argued that this individual might have been more successful with fewer statements. It is also possible that this subject's self-talk indicates an ability to introspect more so than the other subjects in the study. One unusual

characteristic is that this subject has more negative statements on successful attempts than on failures (.40 vs. .20). This result is contrary to the general findings of the study and perhaps reflects the subject's unique thinking style. S16 also had three statements in the irrelevant category out of a of five for all subjects. This again demonstrates the idiosyncratic thinking style of this subject.

In summary, the majority of subjects in the high performance group have high levels of self-efficacy and show an ability to stay focused on the task displaying a relatively large proportion of specific self-instructional and analytical statements. These subjects also tended to have fewer emotional (particularly negative) reactions towards their performances.

F. Results of the Lower Group

From Figures 3, 4, and 5 one can differentiate subjects 17, 19, 32, 34, 24, 28, 29, 33, 39 as having performed relatively poorly in comparison with the other subjects. Four subjects in this group: S17, S19, S32, and S34 did not clear a height during the testing occasions. The other subjects in the group had both low performances and low proportions of successes; S24 (2.00 m, .29), S28 (1.65 m, .13), S29 (2.00 m, .13), S33 (2.00 m, .50), and S39 (1.65 m, .17). Three subjects 32, 33, and 34 were among the group that had the fewest total attempts and two of these, S32 and S33 were affected by injury problems and thus were excluded from this group. The average self-efficacy levels of this group were as follows: S17 (0), S19 (85), S24 (45), S28 (27), S29 (42),

S34 (10), and S39 (46) for an overall average of 36. This group displayed diverse thought patterns and styles. Subjects 17 and 34 both shared low average efficacy scores. Subject 17 had a relatively low proportion of positive thoughts (.08) but did not have an exceptionally low proportion of negative thoughts (.24). Further investigation reveals that most of her thoughts were in the self-instructional (.57) and affect (.24) categories. These specific self-instructional thoughts were similar to those of the upper groups, e.g. "go fast," "get knees up" however the complementary analytic-evaluative statements were lacking (.04). The affect statements were primarily negative expressions of frustration in being unable to perform the task, e.g. "frustration!!" and "I can't do this." It may be that the ability to focus on task specific-thoughts before the attempt allowed this subject to persist in the face of adversity. This subject also had no successful attempts and had four balks and aborted attempts. S34 was also unsuccessful in clearing a height and had a very low average efficacy score and tended to focus on negative thoughts reflecting fear of the task as noted above.

Subject 19 who similarly failed to clear a height had a very high average efficacy score (85). The majority of this subject's statements were in the self-instructional (.38), e.g. "run fast, arm up," evaluative (.38) "run is good," and confidence categories "unsure of my ability" and "I'm going to do it." The thoughts were not excessively positive (.17) nor negative (.28). The majority of the negative thoughts were non-specific, e.g. "something is wrong" which from context

seemed to refer to body feelings. The high efficacy levels suggests that this subject had unrealistic expectations, perhaps as an attempt to cope with low performances.

Subject 24 has comparatively few positive thoughts (.12) as compared with (.34) negative. Though the subject makes a number (.35) of self-instructional statements, they tend to occur with statements that are generally in nature, e.g. "I did a lot of bad things wrong," "Bad vault," shit." This indicates that perhaps the subject is unable to analyze his own performance clearly. Other thoughts refer to the task as difficult, e.g. "very high," "seems hard." Similarly S29 had more negative (.39) statements than positive (.22). Though this subject had .56 evaluative-analytic thoughts, they were primarily vague, non-specific statements, e.g. "Technique was horrible," "all wrong," emphasizing the negative, "it's all getting worse." It is interesting to note that the subject had only .04 self-instructional statements indicating that the subject was not able to specify clearly the aspects of the task which needed correction. The few positive statements made were also vague, e.g. "I must work on my form." S28 was similar to S29 in that she focused on evaluative statements (.37) which were also general in nature, e.g. "I'm not doing everything right," "I'm not progressing," "that was a lot better." These thoughts also indicate unrealistic expectations whereas others, e.g. "I hope to get over," indicate a passive rather than an aggressive approach to the event. Also though the subject made a number of self-instructional statements, they were frequently general in nature. In contrast S39's thoughts were

almost exclusively self-instructional (.54) or analytical (.31) and unlike other members of this group were specific and clear, e.g. "shorten run, keep steps long, fast," "too slow, too many steps." This subject also did not have many positive or negative thoughts (.06, .06) similar to several of the subjects in the upper group. It is possible that factors other than cognitions or efficacy (average 46, in female group) such as physical talent were responsible for the relatively low performance in this instance.

In summary, the lower group had a wide range of thinking patterns and moderate to low self-efficacy levels. Two subjects (S17 an S34) had efficacy levels that corresponded to lower performances. The majority however had moderate efficacy scores. A number of subjects' (S24, S28, S29) thoughts were characterized by a lack of specificity. Two subjects (S17, S29) focused on either self-instructional or evaluative statements, unlike the upper group which tended to emphasize both. It is likely that ability factors such as speed and strength may have underlined the lower performances for the majority of subjects in this group.

G. Comparing the Upper and Lower Groups

In comparing the high and low groups one can first note the differences in self-efficacy scores with the upper group showing very high levels of efficacy and the low group showing moderate levels. Overall, the upper group is less negative and more positive than the low group. The most noticeable differences are the greater proportion of

negative statements on failures by the low group and the greater proportion of neutral statements by the upper group on failures. In this case it appears that the lower group tends towards negative more self-critical statements on failures than the upper group (.31 evaluative, .30 negative for the lower group; .26 evaluative, .20 negative for the upper group). This is also supported by the increase in self-instructional statements by the upper group on failures as compared with successes. In simpler terms, the upper group tends towards corrective, self-instructional focus and specific analytical feedback, whereas the lower group tends towards making more critical, less specific statements focusing on the negative aspects. The above statements must be taken as general trends as opposed to confirmed absolutes given the variability in each group.

H. The Middle Group

The rest of the subjects (middle group) collectively had a median self-efficacy average of 56 and performance of 2.40 m. The cognitions of these subjects varied widely in their pattern and emphases. Twelve subjects in this group had .35 or more negative thoughts. Of these six subjects also had relatively high proportions of affective statements. However, only when affect, negative, and low proportions of self-instructional and evaluative statements were present did performances tend to be poor. This occurred in two subjects (15 and 30). Subject 15 emphasized thoughts that were indicative of frustration, e.g. "Frustrated, This is stupid" and a negative attitude, "I know I'm going

to screw up, I hate this." Subject 30's statements primarily reflected negative affect, e.g. "nervous, I feel like crud" and a lack of confidence "I'm going to fail." Subject 26 also had high proportions of negative (.58) and affect-laden thoughts (.26), however this subject also was confident (avg. 84) and was relatively successful with a best performance of 2.75 m. On a number of occasions (six), this subject indicated a lack of confidence, e.g. "I had no confidence, no confidence but determination" which was contrary to the efficacy ratings. It is possible that this subject is a perfectionist, this conjecture is partially supported by the frustration and negative evaluations on successful attempts, e.g. "happy I made it but not too satisfied."

Three other subjects with high proportions of negative thoughts were moderately successful and had moderate efficacy expectations; S18 (76, 2.50 m), S25 (55, 2.40 m), and S31 (53, 2.40 m). Statements from three other subjects who also emphasized the negative primarily reflected analysis and self-criticism, e.g. S38 "should have taken off with the other foot, still have not come close to doing it right;" S40 "Brutal jump, everything OK but the plant was way off;" S3 "I screwed up." These subjects were not unsuccessful (2.40, 2.50, 2.70 m respectively) and their self-efficacy ratings were moderate (47, 45, 62).

In summary, it seems that in the middle group subjects who display relatively large proportions of negative thoughts vary widely in their performances indicating that negativity alone does not necessarily correspond with poor performances. In the cases where affect, negative

statements and low proportions of self-instructional and evaluative statements cluster, performances tend to be lower. In most instances the negative statements seem to reflect a thinking style that is analytical and self-critical with task focus appearing to be quite strong.

Four subjects in the middle group made proportionately greater positive statements than their counterparts and included two females S4 (.54), and S7 (.42), and two males S1 (.45), and S22 (.47). S22 averaged 80 in self-efficacy ratings and was relatively successful (.71 successes, 2.70 m). This subject's thoughts were largely focused on statements indicative of confidence, e.g. "I feel nervous but I knew I could do it." Subject 1 averaged moderate in efficacy ratings (42) and also was successful (2.80 m). The majority of statements were reflective of confidence (.21), e.g. "I felt confident and anxious to try again" and eagerness to try again "I want to try again" as reflected by the relatively high proportion of attitudinal statements (.23). As mentioned previously, S4's thoughts were characterized by confidence (.29) and self-instruction (.35) and indicated that the subject was actively coping with the situation. This subject also performed well (2.00 m).

Subject 7 in addition to having relatively high efficacy (55) ratings also was a stronger performer (2.10 m). The subject's cognitions indicated a positive attitude, e.g. "want to clear it" and psyching-up "Do it, Go for it." It is interesting to note that the evaluative statements were primarily general and seemed to act as self-

reinforcements, e.g. "Good, good I'm going fast." In summary these subjects were successful, had relatively high efficacy ratings and were positive, focusing on self-confidence, positive evaluations and a positive attitude towards the task.

Other subjects were also quite successful while varying widely in their self-efficacy ratings; S27 (2.60, 32), S21 (2.70, 54), S8 (2.70, 49), S5 (2.65, 90), S2 (2.60, 50), and S23 (2.80, 80). Of these, S27 had efficacy ratings and performances which do not correspond. In this subject's first session six out of eight statements were negative and efficacy ratings were zero. Thereafter there was a dramatic shift towards self-instructional statements, e.g. "I have to get my steps right," a view of the task as easy, "this should be easy," and greater self-confidence, "I can make this, No problem." Efficacy ratings averaged 42 after the initial experience.

Three subjects had relatively high proportions of self-instructional and evaluative statements; S21 (.45, .43), S8 (.34, .48), and S5 (.30, .39) while others were somewhat less so; S2 (.24, .24) and S23 (.26, .26). S21 had several thoughts which indicated efforts to relax, e.g. "relax, let the jump happen" and also seemed to stress kinesthetic components of learning the task, "good pole plant, how does it feel? Damn, I'm not twisting right, let the jump happen, feel it." Subject 8 was very analytical (.48), e.g. "felt good except for loss of speed" and had .23 negative statements perhaps reflecting the emphasis on analysis. Similarly, subjects 2 and 23 had .24 and .22 p of negative thoughts with S2 reporting thoughts reflecting an active psyching up

process, e.g. "I can make this jump; I've done it before, I can get this with the right steps to give me the power." S5 had exceptionally high self-efficacy ratings (90) and had thoughts similar to the upper groups emphasizing self-instruction and evaluation and making somewhat more positive than negative statements (.28 vs. .14).

In summary, several subjects while displaying thought patterns similar to those in the upper group, tended to have lower confidence ratings. Other subjects e.g. S20, S12, S13, S32, and S33, while having a balance between negative and positive statements, had performances and efficacy ratings lower than their peers, ratings which were not reflected in their self-reports. In this regard one may speculate that these subjects may have been making realistic evaluations based on their perceptions of their ability which may have been viewed as a stable variable. Several subjects S6, S10, and S37 had higher than average efficacy ratings, did not have large negative-positive discrepancies and had lower than average performances. These subjects' thoughts were primarily instructional and evaluative but were not overly negative even on failures (.11, .19, .15). With these subjects evaluative reactions were typically in technical as opposed to self-critical terms, e.g. S6; "Well, I was straighter this time," and S37; "minor adjustments, steps, more speed" with negative thoughts primarily reflecting feelings such as fear and frustration. However unlike subjects in the lower group, feelings such as these were not dwelt upon, but were set aside as new attempts were being made. These subjects were able to focus on the task, e.g. compare the following thought sequences . . . S37;

"disappointment in myself, wondering if the adjustment (fear that higher hold will murder me), still think I can do it" versus S36 "I'm not going to make it, I'm not going to make it, (#?!@)" and S34 "I'm never going to make it, this event is not for me."

I. Sex Differences in Cognition

Tables 7 and 8 show sex differences in cognitions between male and female subjects represented by proportions. Female subjects have a higher proportion of positive thoughts on both successful and failed attempts than do males. Male subjects have a noticeably greater proportion of negative thoughts on failed attempts than do female subjects (.38 vs. .24) and proportionately fewer neutral thoughts (.49 vs. .60). This would seem to be manifested in the proportionately more thoughts males have in the evaluative-analytical category (.29 vs. .20 on successes, .39 vs. .26 on failures). It is also interesting to note that overall females have proportionately more thoughts in the self-instructional category than do males (.32 vs. .23). It may be that on failures males attempt to diagnose and self-critique their performances more than do females who focus more on talking more to themselves about what they are going to do on upcoming attempts. Though females have more thoughts in the confidence category than do males on successful attempts (.16 vs. .12), overall there were no differences. Thus the differences in self-statements between males and females are primarily in the self-instructional and evaluative categories.

Table 7

Proportions of Thoughts along the Polarity Dimension for Male and Female Subjects

| | Females (n = 13; n thoughts = 505) | | | Males (n = 29; n thoughts = 916) | | |
|---|---|---|---|---|---|---|
| | + | N | - | + | N | - |
| Successes | .37 | .49 | .14 | .32 | .52 | .16 |
| Failures — | .16 | .60 | .24 | .13 | .49 | .38 |
| Total | .22 | .57 | .21 | .21 | .50 | .29 |

Table 8

Proportions of Thoughts for Male and Females

| | Si | Ev | C | Att | Aff | N | Im | Irr |
|---|---|---|---|---|---|---|---|---|
| Successes | | | | | | | | |
| Females | .27 | .20 | .16 | .06 | .12 | .16 | | .01 |
| Males | .23 | .29 | .12 | .07 | .11 | .16 | .005 | (.002) |
| Failures | | | | | | | | |
| Females | .34 | .26 | .09 | .05 | .10 | .14 | | .003 |
| Males | .23 | .39 | .10 | .07 | .11 | .11 | .002 | |
| Total | | | | | | | | |
| Females | .32 | .25 | .11 | .05 | .11 | .15 | | .006 |
| Males | .23 | .34 | .11 | .07 | .11 | .13 | .002 | .002 |

J. Comparing Cognitive Assessment Procedures

The results comparing the two sub-samples evaluated by the stimulated recall and the think-aloud procedure with the subjects' results overall are displayed in Tables 9, 10, and 11. Five subjects participated in the think-aloud and four in the stimulated recall condition. Subjects in the think-aloud condition had only .16 positive and .69 neutral thoughts on successful attempts as opposed to .56 and .35 respectively, in the thought-listing condition. A closer look indicates that these differences were primarily in confidence statements (.21 in thought listing vs. .11 in the think-aloud conditions) and in neutral self-talk statements (.14 in thought-listing vs. .40 in the think-aloud condition). For unsuccessful attempts subjects tended to have more negative (.44 vs. .24) and fewer neutral statements (.41 vs. .63) in the thought-listing condition. Perhaps the most striking difference is that only subjects 2 and 10 reported thoughts during performances (1 and 7 respectively) and in the case of subject 10 who reported seven thoughts these were primarily very short, reactionary statements, e.g. "up, no, yes, yah." In this regard these subjects reported an average of 30 percent of their thoughts during performance in the thought-listing condition (see Table 11). There are two most likely scenarios regarding these findings: 1) it is possible that subjects reporting using the thought-listing procedure are in fact reporting what they should be thinking as opposed to what actually occurred, a position reported by Nisbet and Wilson (1977); or 2) the

Table 9

Subjects' Cognitions: Comparing Thought Listing vs. Think Aloud Procedures (n = 5)

| | Thought Listing (n thoughts = 188; n Attempts = 43) | | | vs. | Think Aloud (n thoughts = 180; n Attempts = 30) | | |
|---|---|---|---|---|---|---|---|
| | + | N | - | | + | N | - |
| Successes | .56 | .35 | .09 | | .16 | .69 | .15 |
| Failures | .15 | .41 | .44 | | .13 | .63 | .24 |
| Total | .25 | .41 | .34 | | .16 | .64 | .20 |

| | Si | Ev | C | Att | Aff | N | Im | Irr |
|---|---|---|---|---|---|---|---|---|
| TL Successes | .14 | .30 | .21 | .08 | .13 | .14 | | |
| TA Successes | .16 | .14 | .11 | .04 | .05 | .40 | | |
| TL Failures | .15 | .33 | .12 | .09 | .11 | .16 | | |
| TA Failures | .16 | .31 | .09 | .02 | .14 | .24 | | |
| TL Total | .15 | .30 | .16 | .09 | .11 | .18 | | |
| TA Total | .16 | .28 | .12 | .03 | .10 | .30 | | |

Table 10

Subjects' Cognitions: Comparing Thought Listing vs. Stimulated Recall Procedures (n = 4)

| | Thought Listing (n thoughts = 132; n Attempts = 36) | | | vs. Stimulated Recall (n thoughts = 107; n Attempts = 19) | | |
|---|---|---|---|---|---|---|
| | + | N | - | + | N | - |
| Successes | .30 | .54 | .16 | .10 | .79 | .11 |
| Failures | .09 | .65 | .27 | .11 | .73 | .16 |
| Total | .18 | .61 | .22 | .11 | .76 | .13 |

| | Si | Ev | C | Att | Aff | N | Im | Irr |
|---|---|---|---|---|---|---|---|---|
| TL Successes | .39 | .24 | .05 | .11 | .12 | .08 | | |
| SR Successes | .41 | .29 | .02 | .07 | .03 | .16 | | |
| TL Failures | .30 | .40 | .09 | .09 | .09 | .03 | | |
| SR Failures | .46 | .21 | .13 | .03 | .08 | .09 | | |
| TL Total | .34 | .34 | .04 | .11 | .10 | .05 | | |
| SR Total | .47 | .24 | .08 | .04 | .05 | .10 | | |

Table 11

Number of Thoughts Reported Before, During, and After Performance for the Thought Listing vs. the Think Aloud and Stimulated Recall Conditions

| | Before | During | After |
|---|---|---|---|
| Thought Listing | 73 | 51 | 64 |
| Think Aloud | 108 | 8 | 64 |
| Thought Listing | 48 | 40 | 44 |
| Stimulated Recall | 63 | 21 | 23 |

task may be interfering with the subject's thoughts in the think-aloud condition. From the evidence presented in this study one is not able to suggest which of these hypotheses is more tenable, however it does pose an interesting question for future investigations.

The subjects also varied in the degree of difference in average number of thoughts, from subject 2 who had many more thoughts (as indicated by thoughts per attempt) in the think-aloud condition (15 vs. 4) to subject 15 who had many fewer thoughts in the think-aloud condition (2.5 vs. 4). It is apparent from the comments made by the subjects after the testing that at least two of the subjects (15, 1) had difficulty in speaking their thoughts aloud due to embarrassment, though reports of this problem do not seem to be evident in the literature. It is also possible that individuals differ widely in their ability to verbalize using various procedures.

In summary, subjects while in the think-aloud condition, tended to be less positive on successes, less negative on failures and showed more self-talk statements of a descriptive kind than the same subjects using the thought listing procedure.

Four subjects participated in a retrospective stimulated recall procedure. The results show that subjects tended to be more positive on successes when using the thought listing than the think-aloud procedure (.30 vs. .10). Similarly, subjects were more negative on failures during the thought listing condition (.27 vs. .16). Overall, subjects tended to make more neutral statements while in the stimulated recall condition. Further analysis indicates that there are substantial

differences in self-instructional and evaluative statements on failed attempts between the two conditions with a greater proportion in the self-instructional (.47 vs. .34) and fewer statements in the evaluative categories (.24 vs. .34) during stimulated recall. It is possible that while observing their performances, subjects are reporting "what they must have been thinking." In this respect the stimulated recall would be encouraging certain thoughts given the behavior being observed. However, one would then expect somewhat greater proportions of evaluative statements on the failed attempts in the stimulated recall procedures than were actually reported. One would also expect this given the opportunity to use the video playback, as knowledge of results, that may be utilized to enhance subsequent performances. The use of this procedure in motor skill acquisition settings where veridical reports are required, is a subject that is in need of further and more detailed study in order to establish the efficacy of this procedure.

In summary, there are notable differences in subjects' reports when we compare verbal report methods. Though it is possible that these differences are only due to the fact that the events under study are unique, the results from the present study suggest that the comparison of verbal report techniques is a subject worthy of further research in order to gain a better understanding of the interaction between report procedures and environmental conditions. As noted by Ericsson and Simon (1984), there is a need to establish the conditions under which subjects' self-reports may provide valid representations of processes

under investigations, findings which have implications for both researchers and practitioners in applied and clinical settings.

K. Results of the Post-Session Questionnaire

When subjects were asked in what way self-observations influenced their performances, a majority of respondents (22) indicated that the procedure helped performance primarily through increasing awareness and concentration, positive thinking, and visualization. Six subjects felt that the thought-listing procedure negatively influenced performance primarily by taking concentration away from the task, e.g. "It sometimes made me concentrate too much on what I was thinking and remembering it rather than the task." Subjects were almost equally divided between finding the thought-listing procedure difficult or easy at the beginning of the sessions but by the end of the sessions twice as many subjects reported the procedure to be easy than did those reporting it to be difficult. The majority of subjects (25) stated that they had the most difficulty reporting thoughts occurring during performances with four subjects reporting difficulties before and after performing. Twenty-one subjects found reporting just before performances the easiest with 13 stating after was the least difficult, and only two stated that during performance was the easiest to report. Two subjects indicated that reports of thoughts during reporting may be confabulated, e.g. "sometimes looking for thoughts that aren't there."

Twenty-three subjects felt that observing others was helpful, whereas six stated that it had no effect, and eight subjects indicated

that observing others perform hindered their own performance. Several subjects who found observing others a problem indicated that it contributed to a decrease in confidence particularly when others were doing better or if someone came close to hurting themselves. For others, it distracted them through providing an incorrect technical model. Those subjects who found observing others helpful, stressed the informative aspect, e.g. "It helped me to see what not to do" and "It helps to become more aware of what is expected in the performance."

The majority of subjects (31) stated that self-observations had either no effect or had a positive effect on their emotions. Five subjects felt that it had a negative influence. Subjects were equally divided as to whether they found vaulting stressful and worrying or exciting and motivating at the beginning of sessions, whereas at the end 27 subjects found it motivating and only twelve found it stressful. Subjects with negative feelings felt that the class progressed too quickly for them, felt tense from the worrying of others, felt frustrated, whereas others tried to avoid the situation, e.g. "spent a lot of time trying to be last in line" and "try to jump as least as possible." Coping strategies used by people involved focusing on their technique, erasing negative thoughts, positive self-talk and confidence statements and feelings of control, e.g. "the more I did it the more in control I was."

All 42 respondents stated that they used imagery with 28 subjects indicating that they used it more than some of the time. Subjects stated that it helped them to focus on specifics, e.g. "It helps me

concentrate on s specific task;" it seemed to be useful when a good model was used, e.g. "helpful because I used a good jumper," and for error correction, e.g. ". . . to picture myself . . . doing the jump and correcting previous errors." Subjects who found imagery not so useful, stated that it interfered with their concentration, that it made too much to focus on, and contributing to their negative feelings, e.g. "all I thought about after mental imagery was falling."

Eleven subjects evaluated themselves primarily on whether or not they cleared the bar with eight subjects focusing on how they performed the technique, e.g. "If the technique was done properly then clearing the bar will happen" whereas the majority focused on both aspects, e.g. "Both because if I made the height but I did not feel right or look right I was not satisfied" and "I used whether or not I cleared the higher heights, but it lower it was how." Thirty three subjects reported that they set at least some clear goals. A number of these subjects focused on the technical aspects (9) when goal setting, while others focused on reaching a particular height (4), getting over the bar (5), and nine subjects set goals according to both technique and reaching a certain height. Two subjects emphasized acquiring competency while another was concerned with "doing my best." Two subjects were uncertain about their expectations and one subject was happy to survive "without killing myself."

Subjects were divided as to whether they were satisfied (19) or unsatisfied (18) with their progress in learning to vault. Among the comments of people unsatisfied with their performances were concerns

that the pace of the course was too quick, feelings of being under pressure and too little practice time, and wanting more emphasis on technique and less on height. Only two subjects were unhappy with their participation in the study ". . . frustrating since I had to put to paper my faults" and "increasing stress." Most subjects were glad to help, found it interesting, a good learning experience, or found it a novelty.

# CHAPTER V

# SUMMARY AND CONCLUSIONS

## A. Conclusions

The purpose of this study was to explore the relationships between self-efficacy, performance, and subjects' thoughts. A secondary purpose was to compare data gathered via the thought-listing procedure with verbal reports using a visually based stimulated recall procedure and a think-aloud procedure. The subjects were 29 male and 13 female university of Alberta undergraduate students taking Physical Education 229, Introduction to Track and Field, for credit. Subjects were briefed regarding the study on the occasion of the first pole vaulting class. They were also provided with a verbal description and a videotape of experts performing the task. They were then instructed according to teaching progressions developed by Simonyi. Testing was carried out on the first day the subjects attempted to clear heights over a bar and on two subsequent occasions. Subjects upon entering the testing area were provided with instructions regarding the procedures. Subjects evaluated their confidence in performing a vault on a 100 point self-efficacy scale before each attempt. After each attempt they filled out a thought-listing form reporting the thoughts they had just before, during, and after their performance. The instructors tabulated an on going record of performance. Between the second and third testing occasions two subsamples of volunteers participated in a comparison of

the thought-listing technique with that of a think-aloud and stimulated recall procedures. Based on the findings and within the limitations of this study, the following conclusions are made:

1. Self-efficacy was a low to moderate predictor of performance and was a stronger predictor of performance than were previous performances at all testing times. Performance was also a low to moderate predictor of self-efficacy scores supporting the view that a reciprocal relationship exists between the two variables. These results support the findings of Feltz (1982), Feltz and Mugno (1983), and McCauley (1985).
2. Average self-efficacy scores were moderately predictive of performance.
3. As subjects became more proficient at pole vaulting, self-efficacy did not become a stronger predictor of performance.
4. Subjects with high average self-efficacy scores were not generally more positive than those with low efficacy scores but they did tend to be more task focused and less negative.
5. The average self-efficacy scores were higher for males than for females in accordance with the findings of Corbin et al. (1983).

From the protocol analysis the following conclusions are drawn:

6. The better performers had almost equal proportions of positive and negative thoughts on successful attempts and had lower proportions of positive and higher proportions of negative thoughts on failures. The subjects with relatively poorer performances were quite similar to the upper group in their thought patterns,

however, they had considerably more negative thoughts on failed attempts. Overall, the lower group placed greater emphasis on both self-instructional and evaluative statements than did the upper group, with the largest differences being more self-instructional statements by the lower group on successful as well as more evaluative statements on failed attempts. Qualitatively, statements made by the upper group tended to be more specific and analytical than those made by the lower group. These results are in keeping with the findings of Klinger et al. (1981) and Scanlan et al. (1981).

7. Female subjects tended to be more positive than their male counterparts on successful attempts and less negative on failed attempts. These differences were manifested in the greater proportion of self-instructional statements by females and by fewer evaluative statements.

8. A comparison of the verbal report methods indicated similarities between both retrospective methods; thought-listing and stimulated recall. The results of the think-aloud procedures, when compared with thought-listing, indicates that subjects had either none or very few reported thoughts during performances. Results from the post-session questionnaire indicate that subjects had the greatest difficulty reporting thoughts during the performance of the task.

These conclusions must be regarded more as descriptors of general trends in the data presented here and are not to be interpreted as confirmatory evidence of the hypotheses put forth here.

B. Implications, Problems, and Suggestions for Future Research

The results of the present study focus on the relationship between performance, self-confidence, and subjects' thoughts. The evidence indicates that better performers seem to be more self-confident, less self-critical, and more clearly task-focused as suggested by their thought patterns than the poorer performers. Teachers and coaches should be aware that potentially useful information may be gained by asking students to relate their thoughts during performances. In this way strategies can be devised to counteract any tendencies towards thinking that may be interfering with or inhibiting performance. Similarly educators can monitor their students' confidence levels and if necessary devise strategies to increase confidence should this be a problem. Both types of information can be gathered simply by talking to the individual in question.

One problem with this study was the lack of imagery reported even though subjects stated that they used it while performing. It is possible that the reporting of imagery was not stressed sufficiently in the instructions. Future research should ensure that this aspect is stressed as being important in the reports of the subjects. In addition it may be easier for subjects to place each thought statement in a "box" than to place a dash before each separate thought, more in keeping with the procedures outlined by Cacioppo and Petty (1981).

The use of the self-efficacy scale which attempted to capture efficacy ratings at the beginning of each class on predetermined heights

was found to be impractical in that subjects were allowed (and it is advisable to do so given the variability in ability) to make attempts at any height they wished thus these data were not used in the analysis. Bandura (1978) indicates that testing should occur just before performance thus it is possible that gathering such data would be redundant.

Another problem lies with the categorization of subjects' thoughts. In particular, the category "Affect" is questionable in that subjects' overt affect related statements may not be indicative of their emotional state at the time. Researchers may want to use one of the various scales available for measuring mood or emotional states rather than attempting to draw conclusions regarding emotional states solely on the basis of verbal reports. It is possible that to a certain extent the results are a reflection of the categories used which cannot be considered definitive. Further research is warranted regarding their use. This problem can be related to that of contextualization as discussed by Ericsson and Simon (1984). In this respect there is a trade-off between the usefulness of retaining a greater portion of the semantic content when interpreting in a context with that of biasing interpretations by relying too heavily on prior expectations (statements become interdependent).

A final problem is that of the validity of the verbal reporting procedures themselves. Since verbal reports are widely used in clinical, educational, and sport settings, it is important to know the conditions under which they can be relied upon to provide a valid

representation of one's thought processes. In the sporting context, knowledge of athletes' thoughts are used in helping athletes to focus on the task at hand more successfully. If such procedures are to be successful, they are in part dependent upon a valid report of the subjects' thoughts. In view of the finding that there appear to be differences between the concurrent think-aloud procedure and the retrospective thought-listing and stimulated recall procedures, further research comparing these procedures is in order.

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## Appendix A

## The Push Carry Method of Pole Vaulting

## Appendix A

## The Push Carry Method of Pole Vaulting

This method eliminates both the total carry of the pole and its planting into the box in the conventional fashion. Since the pole slides on the runway during the approach (via its low friction, special plug), only approximately fifty percent of its weight has to be supported by the vaulter. Planting is also eliminated in its conventional sense: the pole, having slid during the whole approach on the runway, simply ends up in the box. All the vaulter must do is lift his pole's top end up in front of his head and grab it with his bottom hand during the pen-ultimate stride.

1. Holding the pole with your right hand (right handed vaulter) slightly above your shoulder and close to your cheek, pushing its bottom end on the runway, run with the pole using your left hand freely, as you would when sprinting.
2. Stand with the pole above your right shoulder, its bottom end on the ground. Simultaneously stepping forward with your right foot and pushing your pole forward and up with your right hand and grabbing it with your bottom hand, moving it straight forward, secure a wide grip. Then step forward with your left foot (your take-off foot) and lifting your right knee up and forward, simulate a take-off, landing on your left foot immediately after a short time spent in midair (of course, your pole in the meantime keeps

sliding forward so that you will have actually long-jumped a short distance). Practise this well.

3. Now, jog slowly, pushing your pole on the runway, and practise the above preparation for your take-off and actually take off repeatedly. Make sure that your timing is correct: your lifting the pole from your shoulder forward and up and your grabbing the pole with your bottom hand occur at the same time while your right leg is coming forward. In this way your pole is in position for your take-off before you start taking your last step.

4. Stand the pole upright and reach up with your top hand as far as you can and then add a foot or so to this. This is the beginner's grip height. After you have mastered the pole preparation and the take-off, go to the box and stand up at two strides' distance from your take-off spot. Then prepare and take off (right, LEFT) moving as fast as you can. The planting movements begin as soon as you move the right foot forwards. Make sure your top arm remains straight after take-off and that you stay on the ball of your take-off foot. Carry the pole with you into the pit, as you ride the pole, landing on your seat. Try to keep your right knee bent from take-off to landing.

5. Now go to the box, place the pole's bottom end into the bottom of the box and raise it at straight arm's length above your head. Standing on the ball of your take-off foot and picking up and forward your right knee, ask the instructor or friend to adjust the position of your take-off foot to the upper hand: a vertical line

down from the top hand should "hit" the big toe of the take-off foot. If you were "inside" (in front of the vertical line) you have to move your checkmark back; if you were "outside" (behind the vertical line) you must move forward, toward the box.

6. Move back to four steps and besides keeping your top arm straight and your right knee bent, try to kick your straight left leg (take-off leg) having kept it back momentarily after take-off, forward and up. The kick enhances your long swing after take-off (helps you to maintain your vertical body position for a fraction of a second); keeps you for turning inwards (towards the pole); and assists you in rocking back after the swing. At all times run as fast as possible.

7. Move back to five running steps. Run up and after the planting and take-off movements have been executed, kick the straight left leg and swing forward, continue with a sudden bend in the hips and knees, so that at the end of the "rock-back" your knees are close to your chest, and your eyes are looking straight up.

8. Next to learn to turn, lie on the landing mat, on your back. Quickly rock back and continue extending your body (legs shoot straight up) with an inward twist so that you end up on your stomach, facing now 180 degrees away from your original position. Your legs still face the initial direction.

9. Increase your run-up now to six and eight strides doing the movement learned above while on the pole. With each increase in run-up length the grip height will also be increased a little

(eight inches to a foot for every two feet). Once the above movements have been learned, have the subjects vault over a low bar (six to eight feet in height).

## Appendix B

## Instructions and Procedures

## Appendix B

## Instructions

For each class in which the thought listing procedure was used the following procedures were adhered to:

Subjects upon entering class were told: "Please fill out the first jumping efficacy scale. Just before each attempt you make today record the degree of confidence you have in being able to clear the height you are attempting. Just after your attempt write out the thoughts you had before, during and just after the attempt. I now want you to read the instructions before you begin vaulting."

The written instructions were as follows:

Procedures

The following describes the order in which you are to respond:

1. At the beginning of class enter your response on the jumping efficacy scale (there is a hierarchy of tasks representing the heights you will attempt).
2. (a) Just before your first attempt enter on the second jumping efficacy scale the height or task which you are about to perform; (b) as the official calls out your name to jump check off the appropriate box on the jumping efficacy scale your confidence in being able to perform the task.
3. After performing take a few minutes to write the thoughts that were going through your mind before, during and immediately after the jump in the appropriate space.

4. Indicate on the jumping efficacy scale whether the attempt was successful or not.
5. Repeat steps 2 - 4 for each attempt.

We are interested in everything that went through your mind during the previous performance/attempt. Please list these thoughts and images, whether they were about yourself, the situation, and/or others, irrelevant or relevant to the task; whether they were positive, neutral, and/or negative. Any case is fine. Ignore spelling, grammar, and punctuation. You should be able to complete this in a few minutes. We have deliberately provided more space than we think people will need, to insure that everyone would have plenty of room. Please be completely honest. Your responses will be confidential. The next few pages are forms prepared for you to use to record your thoughts and ideas. First place a dash at the beginning of the line on which you write your first thought. Write your thoughts preceeded by a dash at the beginning of the line, the dashes are used to separate the thoughts. Write them down in the order in which they occurred. Please put only one idea or thought in each space. We are interested in your thoughts during: a) before attempts, b) during each attempt (after you've been called by the official to make your attempt), and c) immediately after each attempt. The forms are organized temporally according to the above mentioned categories (a through c). Please be completely honest and list all the thoughts you had.

For the think aloud procedure subjects were required to wear an audio transmitter that was attached to their waists with a microphone

clipped near their sternum. The subjects were then given the same verbal instructions mentioned above and in addition they were told: "I want you to speak your thoughts aloud. Everything that you say to yourself in your mind should be spoken aloud as it occurs."

For the stimulated recall procedure subjects, in addition to the verbal instructions as provided in the thought listing technique subjects were told: "After every attempt you will watch your performance. While you are watching speak aloud what you were thinking at the time. Your statements will be recorded on tape."

The jumping efficacy scales were responded to in the same manner as in the thought listing procedure.

## Appendix C

## Jumping Efficacy Scale

## and

## Thought Listing Form

## Appendix C

## Jumping Efficacy Scale

Instructions:

Self-efficacy is the belief that one can perform a particular task. It can be thought of as situationally specific self-confidence. For the following jumping heights, rate the strength of your efficacy (confidence) belief to perform a jump by recording a number from 0-100 using the scale given below. Rate what you expect you could do and your confidence if you were asked to perform the tasks now.

% of Certainty

Great Uncertainty — Complete Certainty

| Jumping Heights: | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Thought Listing Form

Attempt # -- 1

Height --

Thoughts BEFORE completing the Jumping efficacy scale (BETWEEN JUMPS)

Thoughts DURING the JUMP:

Thoughts IMMEDIATELY AFTER the JUMP:

## Appendix D

## Background, Day-to-Day, and Post-Session Questionnaires

## Appendix D

### Background Questionnaire

Name:

Birthdate:

School, year:

1. Do you have any experience as a competitive track and field athlete or as a gymnast?

2. If so, what are your previous best performances and achievements.
   -- last year -- last competition -- during last week's practises
   -- during your last practise

3. Do you compete in any other sports? If yes, which ones and how long and at what level?

4. Are you under any medication? YES NO If yes, describe the medication and reasons for its use.

5. Have you had any recent injuries? If yes, please describe the nature, extent, and present status.

## Specific Day-to-Day Questionnaire

1. Are you under any medication? YES NO If yes, describe the medication and reasons for its use.

2. Have you had any recent injuries? If yes, please describe the nature, extent, and present status.

3. Have you exercised earlier today? If yes, please describe the activity, its duration and how long ago you finished.

## Appendix D

### Post-Session Questionnaire

Please answer frankly. Do not be concerned with being nice or telling me what you think I want to hear.

1. Can you think of any ways in which your attempts at self-observation influenced your performance, for better or for worse?

2. How difficult or easy did you find the task of self-observation at first?

very difficult very easy

1 2 3 4 5 6 7

Can you comment on any difficulties you had early on, or on parts you found helpful or easy? Which phase, before, during, or after performance was the easiest for you to describe? The most difficult?

By the end of the sessions, how easy or difficult was it?

very difficult very easy

1 2 3 4 5 6 7

Can you comment on problems and parts you found helpful?

3. Was it a help or hindrance observing others jumping?

hindrance no effect helpful

1 2 3 4 5 6 7

4. Did self-observation influence your feelings/emotions during the sessions?

| negative influence | | | none | | | positive influence |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Comments?

5. How satisfied or unsatisfied were you with your progress in learning to vault?

| very dissatisfied | | | | | | very satisfied |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Comments?

6. Some beginners find vaulting stressful and a source of worry while others are excited and motivated by the practice sessions. How was it for you in the beginning?

| very stressful worrying | | | neutral | | | exciting, motivating |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Comments?

How was it for you in the end?

| very stressful | | | neutral | | | exciting |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Comments?

What parts were most stressful?

If parts were worrying and stressful for you and you were able to cope with, control, those feelings, please comment on the ways in which you learned to cope.

7. How do you feel now about having been involved as a subject?

very unhappy very happy

1 2 3 4 5 6 7

Comments on why?

8. To what degree did you find yourself using mental imagery while learning to vault?

not at all some almost always

1 2 3 4 5 6 7

Did it interfere or was it helpful? Comments?

9. Some people evaluate themselves according to whether or not they cleared the bar whereas others focus more on how they executed the task. Some use both. Which aspect of self-evaluation did you focus on? Feel free to use examples.

10. To what degree did you set clear goals for yourself during learning to vault?

not at all some almost always

1 2 3 4 5 6 7

If you did, please comment on how and in what areas you set goals.

## Appendix E

## Five Number Summaries

## Appendix E

## Five Number Summaries

### Total Number of Attempts

| | L | q1 | M | q3 | V |
|---|---|---|---|---|---|
| Females | 4 | 7 | 8 | 9 | 11 |
| Males | 3 | 7 | 8 | 9 | 10 |
| Total | 3 | 7 | 8 | 9 | 11 |

### Total Number of Successes

| | L | q1 | M | q3 | V |
|---|---|---|---|---|---|
| Females | 0 | 1 | 1 | 3 | 5 |
| Males | 0 | 2 | 3 | 4 | 8 |
| Total | 0 | 1 | 2 | 4 | 8 |

### Total Number of Failures

| | L | q1 | M | q3 | V |
|---|---|---|---|---|---|
| Females | 3 | 5 | 7 | 7 | 9 |
| Males | 0 | 2 | 4 | 6 | 0 |
| Total | 0 | 3 | 5 | 7 | 9 |

### Proportions Number of Successes

| | L | q1 | M | q3 | V |
|---|---|---|---|---|---|
| Females | 0 | .13 | .20 | .36 | .56 |
| Males | 0 | .22 | .40 | .57 | 1.00 |
| Total | 0 | .20 | .36 | .50 | 1.00 |

Maximum Performance

| | L | q1 | M | q3 | V |
|---|---|---|---|---|---|
| Females | 0 | 1.70 | 1.70 | 2.00 | 2.20 |
| Males | 0 | 2.20 | 2.50 | 2.70 | 3.10 |
| Total | 0 | 1.70 | 2.25 | 2.70 | 3.10 |

Average Self-Efficacy

| | L | q1 | M | q3 | V |
|---|---|---|---|---|---|
| Females | 0 | 27 | 37 | 63 | 71 |
| Males | 10 | 45 | 55 | 80 | 100 |
| Total | 0 | 43 | 535 | 72 | 100 |